The Builder.

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Fortification.

AMONGST the able men who at the present time aid with their experience, their counsel, and their advice our Inspector-General of Fortifications, and through him our Secretary of State for War, and through the Secretary of State for War the Ministry of the day, is to be found the author of the work on "Fortification"* from which the foregoing extract has been made, and it reflects in a measure not inconsiderable the tone which pervades the whole work, which is a work of great power, of great research, of careful balance between advantages and disadvantages, and is wholly distinct in style to any other work on this subject with which we are acquainted. But more than this, it has been presented to the public at a most appropriate period—a period of profound peace, when matters of this kind can be calmly weighed and criticised, and the difference between right and wrong is more likely to be correctly determined than can ever be the case in the time of feverish excitement and semi-panic to which civilised nations are generally prone when war seems imminent.

It may perhaps be thought that such a subject is hardly within the proper scope of an architectural journal; but at all events the author of the work thinks otherwise, since he has laid his book before us for review; and as a matter of fact, the fortification of our empire must always be a matter of the deepest concern to every one of the four classes of the readers for whom our journal is especially published, and must be intimately connected with their prosperity. We have to fortify both the land and the sea, we have to build forts as well as ships; we have to consider, not merely as a matter of what is best for success, but also what is best for our national purse, the materials of which those fortifications shall be made. We have not merely to guard our island home for the above-mentioned and other classes of the community, but to do our duty also to the children who have left the nest but prefer to cling to empire, and to strengthen instead of snap the cords which connect them still with the old country.

It is the due selection of the materials of which these fortifications should be made which influences the expense which has to be incurred, and the first item of national fortification is men. We will, however, assume, and not enter into any argument on such a point, that our nation has a sufficiently numerous population, and we hope (not perhaps with absolute confidence) that the organisation of that population for war justifies the idea that a sufficient proportion of men, *i.e.*, trained men, would be able to turn out and take their share in the fortification of the country whenever its integrity is menaced and its existence threatened.

It is from a point of view almost as broad as that above indicated that Major G. S. Clarke, of the Royal Engineers, treats the subject of fortification. He commences his work by giving a *résumé* of such comparatively recent sieges and other operations of modern war as bear on the question of what is best to be done at the present time. He then measures the respective influences on design which ought to be the natural consequence of improvements in modern weapons of offence. The general requirements of modern fortification naturally follow on the consideration of modern weapons. He next shows how futile it is to presume that any conclusions of the slightest value about coast defence can be arrived at without a thorough study of the naval architecture and general arrangements of the war-ships of possible enemies; and, acting on that view, his work contains, in a form of condensation which is remarkably effective, and in a style which is simplicity itself and suited to the most unprofessional comprehension, a complete account of the powers for offence and defence possessed by the war-ships of France, Russia, and Italy, as well as those of our own country, when engaged with coast defences.

It may seem at first sight that such apparently naval and military questions do not concern our readers, that the consideration of the almost infinite amount of detail connected with them is beyond the ordinary scope of people engaged in peaceful pursuits, but if we bear also in our minds the very large national expenditure which is annually incurred on works of construction and of maintenance for what are ordinarily termed fortifications, and the large amount of work which has been, is, and will have to be done by the engineers and the builders of this country in connexion with these fortifications, it seems probable that a few hours expended on the perusal of Major Clarke's work will be hours well spent, and that the perusal may improve the understanding and expand the mind.

The object of fortification is the economy of life; it should assist a small body of men to defeat a more numerous body, and, consequently, in the days of hand-to-hand combat, the men of war who could afford it covered their own bodies with metal, and the success of a battle depended much on the number of mail-clad warriors that could be brought into the field. So do we fortify our wood with paint, and sometimes our walls with tiles, &c., to defeat the elements of destruction.

The materials of which fortifications are composed may be briefly divided into earth, stone, and iron, the progression of cost being very much in the order named, and, consequently, the object of the engineers of the State, who want to produce the greatest benefit at the smallest cost, must be to utilise the first-named as much as is justified by the end to be obtained. They have to consider the relative power of materials to resist the projectiles which are hurled at them, and exercise their judgment accordingly, so that they afford due protection to the men they are intended to shelter, and (in some cases) to the weapons those men are to use. Major Clarke has laid very great stress in his work on this very point of *the exercise of judgment*, and has produced data to show into what extravagance people may be led by a false estimate of the probabilities of destruction by the projectiles from weapons of offence. It is well to be thoroughly *au fait* as to the practices and theories of our neighbours in these matters of fortification; but we must be careful not to assent too readily to the soundness of Continental decisions, whether they be German, Belgian, French, Italian, or American. For instance, in the course of

* "Fortification, its past achievements, recent development, and future progress." By Major G. Sydenham Clarke, C.M.G., Royal Engineers. London: John Murray, Albemarle-street.

this work, the author has taken the opportunity of exposing the fallacies of some of the conclusions at which a Belgian engineer of renown, General Brialmont, has arrived in the matter of what are called cupolas, or land turrets. Some of these are made to disappear after the gun or guns which they enclose have been fired, and some are not; whilst others there are, designed by a M. Mongin, which oscillate into and out of the firing position. The author weighs with perfect fairness the merits and demerits of this form of fortification, and, referring to a turret which has been provided for Bucharest on the recommendation of General Brialmont, of a similar description to those which had at one time been contemplated to be used for the defences of certain parts of this empire, he says:—

"The cost of the turret at Bucharest was about 10,000*l.*, and for this sum about six movable overbank guns of greater power could be provided. Unless siege warfare is to be regarded in the light of a mere duel on the backwoods principle between guns in fixed positions, all tactical handling of the defence being put out of sight, it may well be doubted whether a movable armament of equivalent cost would not be infinitely more effective from the defenders' point of view. The great advantage possessed by the attack in all ages has been the employment of a mobile artillery against armaments cribbed, cabined, and confined by fortifications. Is it necessary to perpetuate this advantage? . . . . The disappearing cupola is a creditable manufacturer's production. Two or three men buried in a subterranean chamber lighted by a lantern are at the right moment to raise their cupola and deliver an overwhelming fire in the right direction. The mechanical principles are apparently sound: the arrangement will probably work so long as it is not hit by anything heavier than a rifle bullet. The price is satisfactory—to the makers—and purely military considerations are of small account . . . . General Brialmont practically contents himself with sprinkling cupolas over his plans, and retains all the objectionable features of the stereotyped fort. In his view the advance in the power of weapons merely calls for increased protection. He accepts with effusion the designs of the ironmasters, and superimposes them upon all the tricks of drawing-office fortification in its most aggravated form. The new ironmongery is, in fact, to be an addition to old methods, and cannot be trusted sufficiently to form the basis of a new system."

Before quitting the subject of these cupolas, we are constrained to depart here from our intention of excluding from the review of this work any special reference to purely military details, but the somewhat pungent and very scornful manner in which the author finally disposes of these cupolas is too good to be omitted:—

"Given a dead, level, featureless plain, and an enemy who will attack in broad daylight on a given line of a given breadth, a plan of action may be conceived. The ground over which the attack is to take place might be divided up among the different cupolas. . . . At the sound of the bugle the disappearing cupolas rear their heads, and the whole collection of pepper-pot lids twist themselves into position, and come into blind action till the 'cease fire' is sounded. With a well-exercised garrison, this would perhaps be practicable, although, in the excitement of the action, many of the combatants would lose their nerve, forget their *chalk-marks*, and fire far over their enemy's heads. Men who would distinguish themselves for bravery if their comrades were within sight, would unquestionably disappoint expectation if thus buried alive in dispersed iron boxes completely hidden from their officer's eye. The assumptions above made are, however, precisely those which could not occur, and it requires very little imagination to picture the wild confusion which an attack in the grey dawn would create in defences of this nature applied to ordinary topographical conditions. No one would know what was happening, or from what side the danger was coming. There would be no command, no unity of purpose. The cupolas would raise themselves prematurely and disappear when their fire was most needed. The combat would be more unequal than that between good modern cavalry and the ironclad knights of the Middle Ages, who would be ridden through and through and rolled over like so many helpless ninepins. M. Mongin's typical fort is practically a mastless turret ship buried up to the deck-level in the ground, and manned by mechanics. Difficulties and inconveniences of all kinds have to be accepted when a fort is made to steam across the seas, but to gratuitously adopt them in an extremely aggravated form on land appears to be madness. Machinery can aid fortification, but only within limits. Tactical principles and human nature are practically the same in all ages, and in them alone can a solid basis be found for systems of fortification."

The only example which we have in this country of a work corresponding in any way to those of the above-named nature, is the turret at the end of Dover Pier, in which a pair of eighty-ton guns are mounted. It cost an immense sum of money, and the author considers that the possibility of its jamming when struck has, perhaps, not yet been fully realised. The advantages which he admits that it possesses are (1) complete protection, limited only by thickness of armour and size of port; (2) a relatively small target; (3) all-round fire; (4) two guns combined in one protection; (5) overhead protection given against splinters and shrapnel; (6) the curvature is unfavourable to penetration; (7) the conning tower affords a wide field of view for aiming purposes; and (8) the system has been proved to work satisfactorily on board ship. But he does not approve of the position in which it is placed,—no need to have *gone out to sea*,—and evidently seems to think that the object to be attained there might have been equally well or better effected at a smaller cost. It is easy to write in this light and airy way, but we fail to see how any blame or charge of error of judgment can be attached to those who decided to place this turret at the end of Dover Pier, whether the object could or could not be more cheaply effected now. The decision must have been arrived at most unquestionably after the fullest consideration by every one concerned, both statesmen and soldiers, though probably the experts amongst the artillerymen and engineers had most to say in the matter. But the decision must have been made by the light of the knowledge which they actually possessed, and it is evident that it is as impracticable to foresee all the changes which scientific inventions may make in the details of our fortifications, as it is in the details of weapons of offence, or of the ships which carry them. The position is very parallel to that of the manufacturer who sets up a plant of machinery at great cost, but finds that after a time it repays him to substitute for it a new plant, constructed on still more scientific principles. The shipowners and many other people are in the same situation, and the struggle for the survival of the fittest becomes more and more accentuated as the scientific knowledge of man increases.

The Dover turret belongs, however, to the class of works known as coast defences, and is for a totally different purpose to the cupolas above-mentioned, which are proposed to occupy certain parts of "permanent" land fortifications not exposed to fire from heavy guns in ships. Our Parliament rarely declines to grant the funds which are represented as necessary for the defence of the country, as soon as it is satisfied that those funds are needed; but the cost of iron and steel fortifications, as distinguished from those made of other materials, is so very great that it must be a source of the most sincere satisfaction to every patriotic person if our military engineers can convince us that they may be to a great extent, and perhaps entirely, dispensed with. That is apparently the view with which they now regard such materials, for not only the author of the work now under review, but another military engineer engaged in our War Office, who has produced, at the same time as Major Clarke, a work on fortifications,* says, speaking of cupolas and turrets, that—

"There is no likelihood of their being introduced into the English service. I believe it to be a mistake to put so much money as this system requires into passive protection, which is always liable to be overpowered by a new weapon. It would be better to expend the sum in developing the offensive strength of the place by increasing the number, power and mobility of the armament."

There is another kind of cupola of a much lighter nature, which is assuming a certain amount of prominence, as it was tried at the German Military Manœuvres last year. The author not only alludes to this and gives an illustration of it, but seems to consider that with certain modifications it might find useful employment in advanced defences of "field" type. These "field" cupolas, the invention of Colonel Schumann, who died last year, are intended each to hold one quick firing gun of 1¼ in. bore, protected by a cylindrical case of 1 in. steel with a domed top, the platform and cover being pivoted, so that the gunner who garrisons it can revolve himself, gun, and cover, and, seated on a saddle, can fire ad libitum at the rate of forty rounds per minute if necessary. There is room inside for another man to hand up the ammunition. They are proof against bullets and splinters, and as their weight is only 28 cwt. they can be transported without difficulty on a truck drawn by two horses. They have been used experimentally as stated, but it is very problematical whether they will ever take a permanent place in the material of campaign, as this use of portable iron fortifications seems to bear too close a resemblance to the plate-armour, iron helmets, visors, and similar antique contrivances of the Middle Ages. They could be planted in prepared positions, but could not follow in advance or be withdrawn in retreat. At General Brialmont's recommendation, the Roumanians have been supplied with a good many of these as well as of the larger kind, but our experts do not seem to consider it wise to follow such a lead, and there seem to be good reasons for concluding that guns of the same calibres as those which are held by these cupolas would, if mounted on "disappearing" carriages, be more effective, more portable, and less costly. Consequently, they ought to stand condemned, without hope of mercy; and we have advisedly devoted some space to this branch of the subject, in order to demonstrate that the operations of war cannot be controlled by mechanical genius to the extent that mechanicians would like us to believe.

The historical portion of this work is full of interest, devoted as it is to the examination of the influence which fortification has had on war generally, and on the prolongation by its means of the existence of armies and the retention of important places. They are usually subdivided, at all events by the schoolmen (as the author terms them), into what are called "field," *i.e.*, improvised, and "permanent fortification." Of the former we have laid before us with admirable clearness the cases of Silistria, Kars, and Sebastopol in 1854-5, Petersburg in 1864, and Plevna in 1877. It will be remembered that on the arrival of the English and French allied armies on the south side of Sebastopol after the battle of the Alma, it was a fact that the works of defence of the town on that side were next to nothing; but that as time went on they grew, until at the time of its fall, after holding out for 349 days, the Russians had actually nearly a thousand guns in first line, opposed to about 800 guns of the Allies. The Malakoff Tower, a two-storied casemated building, with five guns only on eachtier, was the only completed permanent work of fortification: all the rest were earthworks thrown up by the Russians during the siege, and the argument held and the conclusions deduced from this lesson by the author and those who agree with him, is that these improvised and comparatively slight works (so far as regards their sections) held the Allies at bay, and kept them from destroying the great dockyard quite as long as would have been the case with more permanent and originally expensive works, with "vast ditches, monumental revetments, clever drawbridges, fantastic traces, exaggerated flank defences, and all the luxuries of engineering fancy."

He at the same time admits that national arsenals should not be left without defences of some sort; and, admitting that, he lays at our feet, fully exposed to view, the crux of the whole matter; for Todleben, the great Russian engineer, distinctly states that, in consequence of having to throw up these

* "Permanent Fortifications for English Engineers." By Major J. F. Lewis, R.E.

works *during the period of the siege* the loss of life in constructing them was enormous.

At Petersburg, at Plevna, and elsewhere the author shows that fortifications composed almost entirely of earth have achieved marked successes, and must always command deep respect, if the men behind them know their work; but he very pithily adds that, "You cannot make an indifferent and badly-handled force *safe* with all your money and art." Armaments are, in fact, useless without men, and men of little use without training.

The author demonstrates that the adoption of the magazine rifle has indisputably caused quite a revolution in many of the details of land fortifications, in their plans, their sections, and the specifications of their materials; that it has also tended to bring into greater prominence the increased value of the least expensive material of which such works can be made, *i.e.*, earth. He pleads, therefore, for a revolution in the teaching of the science of fortification, that students shall be clearly, — more clearly than is the case now, — have impressed upon them that the old systems such as those of Vauban, &c., were systems suited, and probably well suited to the military tactics of their particular period, but that they are not in any way suited to the tactics of the present day, and that until this is done there can be no hope of sound progress, or "of reaching a fair general concensus of matured opinion." "Fort building," he very justly remarks, "is not fortification, and lavish expenditure upon non-essentials can never atone for the absence of real preparation for war. The very elaboration and cost of the conventional defences have tended to induce neglect of real requirements, and to foster the dangerous belief that any troops, commanded in any fashion, will suffice as garrisons."

In the spring of last year a very valuable debate was raised at the United Service Institution in Whitehall by Admiral Colomb, who tried, with some eloquence, to induce the Government of the day to allocate for naval purposes all the funds they could spare from those voted for national defence, and grant little or nothing for that branch known as fortifications. The debate, carried on by statesmen and several of the most clear-headed men in the army and navy, was, as we have said, valuable, in fact, invaluable, for it had an effect which, perhaps, the originator had not contemplated, that of proving most conclusively the criminal folly of neglecting the latter for the sake of the former. Whether Major Clarke's work is intended for the further instruction of this misguided but somewhat influential Admiral we know not, but the evidence he produces in his book of the inutility of modern ships of war to make even a decent fight with fairly well-made and properly-armed coast fortifications is absolutely crushing. We must refer the reader to the work now under review, which is pleasant, light reading, and not burdened with technicalities or elaborate details, for the analysis of the case, for the exposition of the weak points of the war vessels (which are admirably illustrated), and for the description of the class of works now approved for coast defences.

We are not concerned, from our point of immediate interest, to know how long it would take these ships to sink or capture each other, but, judging from the arguments which have been adduced by Major Clarke and others, there seems little reason to doubt that they are capable of performing those operations with considerable celerity. As, however, the question whether an enemy's ships of war would, or would not, be able to ensure some measure of success in fighting coast fortifications is a matter of enormous importance from our point of view, *i.e.*, the nature of the works which should be made to resist them, we cannot do better than give the author's own words to support the definition which we have given of fortifications, viz., that its object is the economy of life. With this object the war-ships are made, so that by smashing their opponents they may save themselves, and the lives and property of their countrymen, and, in confining their work to the high seas, the combat may be assumed to be on fair and equal terms. But, in engaging coast batteries this fairness of combat disappears, and whilst many of the so-called armour-clad ships are so designed that what are called their "vitals," *i.e.*, their guns and engines, are fairly protected, their crews are so exposed in the other very vulnerable parts of the ships, which almost always bear a large proportion to the protected parts, that "the coast battery will not concern itself with their armour, and will employ common shell, which would quickly convert them into slaughter-houses; except for a great and definite purpose, it would be criminal to pit such vessels against moderately-armed coast defences. It is not *essential* to sink a vessel or disable her engines. To cause a heavy loss in *personnel* would amply suffice for the purposes of coast defences, and the position of a modern ship at a long distance from her base, with her unarmoured portions riddled and half her crew *hors de combat* would be eminently precarious. From this point of view, the armoured belt will be of little service to the ship in action with coast defences, but, by keeping her afloat, may lead to her capture by an inferior vessel." Which is cold comfort for the men of the sea, but reassuring for the defenders of our shores.

The author's observations about the Zalinsky gun, a pneumatic tube which will in future be employed in warfare, will give them colder comfort still, if they expose themselves to this new implement of destruction, which costs very little to mount in suitable positions, and will add very potently to the means for protecting coasts, harbours, &c.: a weapon which has been described by Lord Wolseley as "most probably destined to influence, if not revolutionise, warfare in future, both on land and sea."

The author considers that one 6 in. breech-loading rifled gun, well mounted and handled, should be capable of disposing of any ordinary war cruiser by destroying her crew, and the mode of mounting he seems to prefer is that on a disappearing hydro-pneumatic carriage, firing over a wall of concrete, acting as a revetement to earth, the whole gun emplacement being rendered as invisible as possible by avoiding constrasts with the neighbouring ground. One gun of this kind, with its mountings, costs about 2,700*l.*, and it is worthy of note that 200 rounds of ammunition costs about the same as the gun; whilst the emplacement to put it in and the foundation on which it stands, would not cost more than from 200*l.* to 300*l.* We, consequently, recognise two things at the same time, viz., that land and coast fortifications cost at the present day an insignificant sum compared to the cost of the armament, whether of guns or of men, which they help to protect, and that the work of the navvy progresses in importance for such work in contradistinction to the work of the builder, whether in stone or iron. For the national pocket this is highly satisfactory, though by the individual builder it might, perhaps, be viewed in a different light.

The aspirations of the Fortification Department of our War Office evidently point to the probability of their being able, with good organisation and previously-prepared details of all kinds, to throw up, if necessary, in the course of a few days, for the defence of the Metropolis and other strategic points in the United Kingdom such works of fortification as will enable our people, *if properly armed and trained*, to successfully resist a foreign army, if by any fatality it set foot on the wrong side of the "silver streak," and that the ignominious surrender of everything that makes life precious to our people, shall not, as has been predicted by some weak-kneed people, be the inevitable result of invasion.

There is an old French saying that "Nothing is sacred to the sapper," and the author of this work is evidently prepared to justify this to the fullest extent, for he spares no one whose views differ from his own. If he is wrong in those views he will soon be shown the error of his ways by those he takes to task, but as we feel well satisfied that the joints in his harness are few and far between, and that, in the publication of this work, he has performed an act of very considerable public importance, one which will help to prevent the waste of money, and ensure even better fortifications in the future than we have had in the past, he will probably be able to sustain without distress the charge of want of sacredness.

But in the work which we have had the pleasure of perusing, there flows a current of statesmanship underlying the stream of engineering, which attracts to an extent which fascinates the mind and brings conviction to the reader that the words he reads are those of truth and great soundness of judgment. We can do no more than to recommend every one who desires to understand the conditions under which his labour is protected to read and mark the contents of this valuable work.

THE CINCINNATI BRIDGE.

IN Volume XXIII. of the American Society of Civil Engineers' Transactions will be found a valuable and interesting paper by Mr. William H. Burr, M. Am. Soc. C.E., on the bridge recently constructed over the Ohio river at Cincinnati.

The structure, with its approaches, forms a part of the Chesapeake and Ohio Railway system, and is a good example of modern American practice in bridge-building.

The bridge consists of three large spans, the central one being 550 ft. long, between the centre of the piers, and the side spans each 490 ft. between centre of piers. At either end of these large spans is a viaduct approach, which extends for 1,533 ft. on one side and 2,300 ft. on the other, but does not call for any special notice. The whole structure is designed not only for a double line of railway, but also for two roadways and two side walks, for the ordinary vehicular and pedestrian traffic.

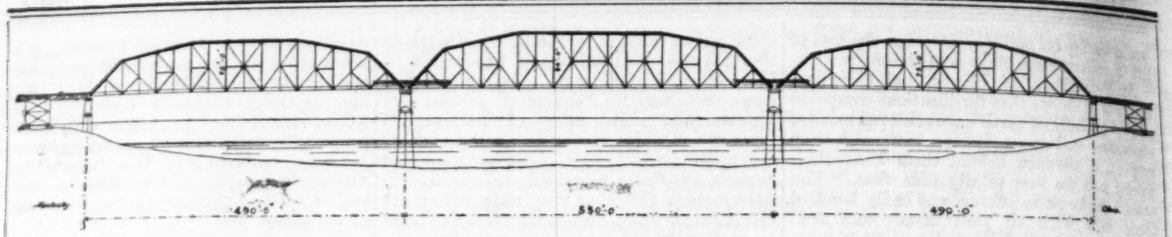
The simple non-continuous truss over the middle opening is the largest one yet constructed. All the main parts of the trusses are of steel, but no specific process of manufacture was insisted upon, provided the material stood the tests specified; consequently we find both Bessemer and open-hearth steel largely used in the work. The lateral and transverse systems of bracing and the floor beams and stringers are of wrought-iron.

The weight of iron and steel in the two 490-ft. and one 550-ft. span is 5,000 tons, and an additional 5,180 tons was required for the construction of the viaduct approaches.

The specifications under which this work was executed were drawn up by the Phœnix Bridge Company, by whom the entire work of these spans was designed, constructed, and erected. The type of truss adopted is that generally proposed by the Phœnix Bridge Company for large spans. It will be noticed that the single system of web members is used, and consequently the stresses are well defined.

The work of the construction of these spans was commenced in the shops in March, 1888, and in June, as soon as the state of the river would permit, staging was begun for one of the 490-ft. spans, and the whole span was erected by August, although it had a very narrow escape at one time of being carried down the river by a flood during the early part of July. This flood caused a rise in the river of about 25 ft., and great quantities of drift were brought down by the current and lodged against the stage, which was then carrying a large traveller, and about two-thirds of the trusses and railway floor. The pressure was so great that it pushed the stage about 1 ft. down stream, but did no other damage.

The erection of the 550-ft. span was commenced in August, and towards the end of the month another flood, which rose some 27 ft., brought down the river such quantities of drift that it swept the stage for this span,



Bridge over the Ohio at Cincinnati.

as well as some 350 tons of the truss which was then upon it, down the river, notwithstanding extensive temporary protection which had been provided to shield the stage as much as possible, and in spite of the whole staff who were occupied in attempts to protect the work that had already been done. Masses of the wreckage were carried down the river fully fifty miles from the works, and two steel eye bars were recovered at a distance of forty-five miles from the bridge.

The Phœnix Bridge Company commenced the reconstruction of this stage at once, and, by working night and day, within five weeks a new stage was built, and the iron and steel floor, which had been reconstructed also in the interval, was placed upon it. The erection of the 550-ft. span was then proceeded with, night and day, and was completed at the end of October.

The state of the river would not permit any stage being constructed for the third span until the end of November, and it was not until December 9 that the first ironwork for the railway floor was placed upon it. The whole of this span, however, was erected and finished in sixteen days.

On December 25, 1888, only ten months after the Phœnix Bridge Company had commenced the work in their shops, the first regular railway traffic passed over this bridge.

The foundations for the shore piers of the two 490-ft. spans were formed by driving piles 4 ft. apart in both directions, to carry solid 12 in. white oak platforms, about 72 ft. by 36 ft. in area, upon which the masonry of the piers was built. These masonry piers are about 82 ft. high, from the timber platform to the underside of the trusses, and their weight, together with the steelwork and live load, causes a load of 40 tons per pile.

The two river piers, one at each end of the 550-ft. span, rest on pneumatic caissons 81 ft. by 35 ft. in plan at the cutting edge, and 51 ft. high. The sides of these caissons batter 1 in 15 to facilitate sinking. These caissons are constructed wholly of timber. The working chamber is 8 ft. 9 in. in height, and the walls are 4 ft. thick. The roof of the caisson is formed by seven solid transverse and longitudinal layers of 12 in. by 12 in. timbers.

The first caisson was launched on June 2, 1887, and at that time only one course of the roof of the working chamber was built, but the remaining six courses were then added, after which it was floated into position behind a row of protection piles, and gradually sunk, the sides being built up and concrete filled in over the roof of the working chamber. The pneumatic machinery and electric light plant was located on two barges alongside the caisson.

The work of actually sinking the caisson was begun on July 1, and continued without serious interruption until the middle of October, when the depth of the cutting edge below low water was some 53 ft., with an air pressure of 23 lbs. per square inch. At this depth the sinking was stopped, and the working chamber completely filled with concrete.

Both the caissons, before sinking commenced, were placed 12 in. up stream, it being expected that they would drift that amount down the river before the work of sinking was completed. This expectation was realised in one case, but the other remained in its first position, and is consequently 12 in. out of its correct place.

The heat in both working chambers was at times very great, and a few men were disabled by the so-called "bends," but no lives were lost, nor were the men apparently injured from working eight hours each shift continuously.

When the caisson was entirely filled up with concrete, the masonry of the pier was commenced, and built up to the bearings of the trusses, at the rate of about 8 in. per day, in height. The weight of the whole pier, steel-work, and live load causes a load of about 6½ tons per square foot, after deducting the buoyant effect of the displacement.

It has already been stated that no specific process of manufacture was demanded for the steel forming the trusses, provided the same stood the tests specified. These tests were as follows:—The ultimate tensile resistance of the steel to be used in tension must not be less than 29 tons or more than 33 tons per square inch, and the ultimate tensile resistance of the steel to be used in compression must not be less than 32 tons or more than 36 tons per square inch. These tests are specified to be made in the following manner:—From one ingot of each cast, a round sample bar not less than ¾ in. in diameter, and having a length not less than 12 diameters between the jaws of the testing machine, shall be furnished by the manufacturer, and from these test-pieces alone the quality of the material shall be determined. Such test-pieces must have an elastic limit not less than one-half the tensile strength of the test-bar, and a percentage of elongation not less than 20 per cent., and a percentage of reduction of area not less than 40 per cent. In determining the ductility, the elongation shall be measured after breaking on an original length of ten times the shortest dimension of the test-piece.

There appears to have been considerable difficulty in obtaining the steel for the heavy plate links which were required, owing to the small amount of work which was put upon the metal between the ingot and the finished plate.

Several tests were made upon the full-sized steel eye bars, and these are of special interest. The general result is as follows:—For open hearth steel eye bars, 7 by 2 in. in section, and 26 ft. 8 in. long, the steel stood 31 tons per square inch and stretched 13·3 per cent. in a length of 24 ft., and 41 per cent. in a length of 12 in. For an eye bar of Bessemer steel 8 by 1$\frac{7}{8}$ in. in section and 34 ft. 6½ in. long, the steel stood 32 tons per square inch in tension, and stretched 14·3 per cent. in a length of 31 ft., and 35·8 per cent. in 12 in.

In designing the main trusses the following loading was provided for:—First, for each line of railway, two engines followed by a train of 2,500 lbs. per lineal foot, and for each roadway and side-walk 60 lbs. per square foot. The wind-pressure was calculated for 30 lbs. per square foot on the exposed surfaces of both trusses, and on the vertical projection of the floor system, and also on a moving train surface, averaging 10 square feet per foot-run of bridge. All the parts of the structure are so proportioned that the combined effects of temperature and all specified loads, except wind-pressure, shall not cause the stress per square inch to exceed the following limits:—

For Iron.

In tension, 5 tons.

In compression, for lengths less than fifty times the least radius of gyration, 4 tons.

In shearing across fibres, 3¾ tons.

In bending, on extreme fibres of pins, 7½ tons.

On bearing surfaces, 6 tons.

The stresses per square inch in compression, for members whose length exceeds fifty times their least radii of gyration, were to be reduced according to certain formulæ given.

For Steel.

In tension, on chord bars and end main diagonals, 8 tons.

In shearing on rivets and pins, 5 tons.

In bending on the extreme fibres of pins, 10 tons.

On bearing surfaces, 7½ tons for rivets and 9 tons for pins.

In compression, on top chords and inclined end-posts, provided that the ratio of length to least radius of gyration does not exceed fifty, 7 tons per square inch; but for other struts the stress was reduced according to certain formulæ given.

An addition of fifty per cent. to all specified intensities of working stresses was allowed for all wind stresses, and for all combinations of wind stresses and other stresses.

Bed plates and bearing plates are so proportioned that the maximum pressure per square foot on the masonry does not exceed eighteen tons, and the diameters of rollers which are of steel are calculated so that the pressure on them per lineal inch does not exceed $\sqrt{540{,}000\,d}$, where d is the diameter of the roller in inches. The variation of temperature allowed for is 150 deg. Fahr. Great care was taken in making the links, as it was specified that in no case must the distance between the centre of the pin-holes be more than $\frac{1}{32}$nd of an inch from the true dimension, and the diameter of the pin-holes was not allowed to exceed that of the pin by more than $\frac{1}{50}$th of an inch for pins under 3½ inches diameter.

In a few instances where the plates were thin the steelwork was allowed to be punched, but, as a general rule, in all important parts of the main trusses it was drilled. Annealing was also insisted upon when any part of the steelwork had been partially heated.

Before the work left the shops it was thoroughly coated with boiled linseed oil, and all planed and turned surfaces were protected by being coated with white lead mixed with tallow. After the erection of the structure it received two coats of red lead.

The above description from Mr. Burr's paper may be taken as representing the best American practice in bridge building, and English engineers will notice that it differs in many particulars from the system adopted in this country.

It appears to us that until the manufacturers of bridges are asked to submit their own designs, made in conformity with a specification of an engineer advising the intended purchaser, true economy will not be obtained.

The system at present generally adopted here not only causes the cost of a structure to be considerably increased, but it is also the cause of much delay in the progress of the work, occasioned by the manufacturers being often compelled to ask for many alterations in the details of the designs. No one is so well able to judge, as the manufacturer himself, where he can save expense in construction; and therefore his tender, based on his own design, would be necessarily less than on designs made by others, who are probably unaware of the appliances he has in

his shops, and who generally do not attend very much to details that are most important from an economical point of view.

In England at the present time a pin-jointed truss is not considered to be so satisfactory as a girder with rivetted joints, and it is most exceptional for them to be used. Such trusses, however, are easily erected, and the rapidity with which the Cincinnati Bridge was built is a good deal owing to the design of the truss being such that most of the work could be completed in the Phœnix Bridge Company's shops, where every facility is obtained, leaving but little to be done at the site, where the work is always more difficult and takes much longer.

Bessemer steel for important structures has not at present been adopted in this country; all specifications for steelwork stating that the material is to be that known as "open hearth." The tests for the steel are almost identical with those specified for the Forth Bridge, although the stresses allowed in that case are somewhat exceeded, notwithstanding that in this country a wind pressure of 56 lb. per square foot is provided for.

In conclusion, we think that the whole work reflects the greatest credit on all who were engaged in bringing to so successful a completion a structure of such importance as the Cincinnati Bridge.

NOTES.

THERE is a grave note of warning in Lord Norton's letter in Thursday's *Times* in regard to the principle involved in the London County Council's Bethnal-green scheme, that it is their duty to take in hand and rebuild large tracts of insanitary dwellings in London; a principle which the majority of the Council seem disposed to affirm as the right one for future adoption. Lord Norton upholds the principle that landlords of insanitary property should be compelled to realise their responsibilities and to do their own duty to their tenants and the public, instead of leaving the County Council to step in and do it for them. As an unintentional rider to this comes the report, in another column of the same day's paper, of the judgment given against the landlords of forty-one tenements by Mr. Montagu Williams, on the action of the Sanitary Authority of the Parish of St. Matthew Bethnal-green, compelling them to close their houses until such improvements had been carried out as would satisfy the Sanitary Authority. Mr. Montagu Williams had the good sense to visit the property himself and form his own independent opinion before giving judgment, a degree of conscientious trouble which not every Magistrate will go to. There is no doubt that if the London County Council are going to make it an essential part of their function to purchase and rebuild large areas of bad property, unless they sternly refuse compensation to the landlords of houses that are "unfit for human habitation" for anything but the mere value of land and materials, they would actually be giving an encouragement to unconscientious landlords to leave their property in an insanitary condition. Then it appears there is a great feeling on the part of inhabitants of the Bethnal-green district to be delivered from the huge blocks of "model dwellings," and to have houses rebuilt on a smaller and more home-like scale. Such a course would be impossible in carrying a large scheme under the "Housing of the Working Classes Act," but it would be not only possible but the natural outcome of the matter, if individual landlords were come down upon and compelled each to rebuild or render habitable his own house property. Of course this is a much slower process, and the glamour about the County Council scheme is that it promises a great work of improvement to be carried out comparatively promptly: and no wonder this attracts people who are wearied with the slow progress of sanitary reform in London. Perhaps it may be as well that this large experiment should be tried, but the drawbacks to it already suggested must not be forgotten, besides another which very few people are alive to, viz.: that not only has the building of lofty blocks of barrack-like dwellings a very depressing effect on the appearance of a neighbourhood, but that the crowding of the same number of people in tall blocks of buildings with a certain minimum space between them may be nearly as unhealthy as crowding them in lower houses more closely set. Overcrowding vertically is very little better than overcrowding laterally; it is only another way of arranging the same number of people on an area too small for them.

THE action of the Mansion House Committee on Railway Rates, in condemning the Board of Trade proposals, is endorsed by the Railway and Canal Traders' Association, a resolution to that effect having been passed at a Council meeting of the latter body on the 5th inst. These proposals cannot, in their opinion, be accepted as just and reasonable,—although Lord Cobham, a Great Western Director, alluding to this subject on the very same day, declared that Parliament was "proposing to whittle down their profits to the vanishing point." Curiously enough, a deputation of South Wales freighters had, a week previously, protested specifically against the Great Western schedules; complaining that (particularly with regard to coal, iron, steel, &c.) the Company were given excessive charging powers as compared with other companies. Turning to the statistics supplied by one of the other companies thus alluded to,—the Midland,—it appears that out of the annual loss of revenue which, it is asserted, they would have to bear if the Board of Trade's proposals became law, £48,216 is placed under the head of coal and coke, and £28,176 for iron and steel (undamageable). This is rather more than half of the total. To add to the conflicting testimony on these points, the Birmingham and District Railway and Canal Traders' Association, led by Mr. Chamberlain, M.P., asserted before the President of the Board of Trade last week that the proposed hardware rates would be from 50 to 150 per cent. higher than those at present in force. The Birmingham district is served almost exclusively by the Midland, Great Western, and London and North-Western, and Sir Michael Hicks-Beach is going to try and get to the bottom of the matter by having a certain number of test cases thoroughly gone into, with a view to ascertaining if the alleged differences really exist. He will probably find that the parties to the dispute are going upon different data,—particularly with regard to the existing powers of the companies in the matter of terminals. In order to demonstrate further the remarkable difference of opinion existing upon this subject, we extract the following from a letter published in a contemporary last Saturday:—

"It is not to be denied that the Board of Trade proposals will be of sufficient advantage to the iron trade, and especially to the finished iron and steel industries. The classification has been lowered for a great many articles of the first importance, thereby allowing of their being carried at much lower rates than those to which they would have been subjected under the companies' proposals, and lower also than those to which they have, in the past, been liable."

Now, this would be written about the time that Mr. Chamberlain was making his energetic appeal on behalf of the iron and steel industries; and yet it appears,—not, as might be imagined, in a railway organ,—but in the columns of the *Ironmonger*.

THE Government have again introduced a Bill for the purpose of establishing a Commission, before whom Private Bills relating to Scotland shall be heard. The proposed change is a very desirable one. Great expense is incurred by bringing up witnesses, say from Aberdeen, in respect, perhaps, of a Water Bill, or some essentially local matter, to London. Parliamentary Committees are by no means first-rate tribunals. It says a good deal for the practical common sense of the average Englishman that these curiously-composed bodies have got through their business as well as they have done; but a strong Commission would not only do their work more quietly but better. It is obvious, however, that if Scotch Private Bill business is to be transacted in Scotland, the same system must be adopted in relation to Ireland, and probably in some modified way in relation to England and Wales also. It seems also likely when this change of system occurs, as occur it certainly will, the system of Grand Committees of the House of Commons will be enlarged, since more members will be available to serve on them, and this again will help to accelerate the general business of the House.

IN reference to the new Institute at Berlin for Professor Koch, already referred to, we hear that the Government has taken the matter up in a very energetic manner, the tenders for the proposed provisionary works having been accepted on most liberal terms, cheapness and Prussian economy being for once left out of the question, the best materials put together on the most improved system in the shortest possible time being all that is required. The hospital for Division II. of the Institute is planned for 128 patients, and will include, besides the four smaller and four larger wards erected on the isolated barrack system, extensive accommodation for doctors, nurses, and a large number of servants, the usual receiving-rooms, studies, &c., localities for the administrative and kitchen departments, and a small lecture amphitheatre (with fifty seats) for Professor Koch's special use. The "barracks" will be constructed of timber-framing with an outside covering of gypsum slabs, and a double line of planking on the inside, the whole standing on a foundation of "béton." The Government "Bauinspector" Böttcher and an assistant have been to Paris to visit Pasteur's Institute, for the purpose of studying the fittings of this establishment, which are to be adopted, as far as possible, in Berlin. Instead of the estimated 370,000 marks, 500,000 are to be spent, directly and indirectly, for the provisionary work. One hundred and fifty beds (with all expenses pertaining to the keeping of them) of the new city hospitals at Moabit and Urban have been put at the disposal of Professor Koch by the municipality of the capital. Among the instances of general interest and munificence, we may mention the gift of Herr Bleichröder, Consul-General for Great Britain. This donor has put 1,000,000 marks (or nearly 50,000*l.*), together with a very suitable site, at the disposal of Professor Koch, for the erection of a small hospital of sixty beds for the treatment of infectious diseases, and intends finding thirty beds in hired premises until the completion of this hospital.

A QUESTION was put to the Postmaster-General on Monday evening in regard to the Liverpool General Post-office, which has for many years been located in a part of the grim and gloomy building known as the Custom-House, against which complaints of unhealthiness and inconvenience have been made for many years, probably with ample cause, and it was urged by Sir G. Baden-Powell that Liverpool ought to have a new Post-office building on the same footing as Manchester and Birmingham. Mr. Raikes, while declining to admit all that was urged against the present quarters of the Liverpool head office, promised to direct special inquiry to the subject. If a new office is to be built for Liverpool, we beg to repeat strongly the recommendation that it should either be entrusted to an eminent architect or be the subject of an architectural competition. The buildings which are turned out from the Office of Works

for this purpose are utterly without architectural refinement or interest. In France every such building would be the subject of a public competition in order to obtain the best planning and the best architecture which the architectural ability of the day could afford, and to erect a building which would be an architectural ornament to the town on which it was conferred. In England each new Post-office is only a new architectural eyesore.

THE Society of Antiquaries of Scotland have now taken possession of the east wing allotted to them in the Scottish National Portrait Gallery. The scheme of arrangement, under the superintendence of the Curator, Dr. Joseph Anderson, locates, in a general way, the historical articles on the ground floor, the pre-historic on the first floor, and the comparative collection on the upper floor. The two former collections are confined to Scottish articles, but the comparative section embraces articles from all parts. In the Council-room, at the extreme east end, will be hung the collection of portraits, which will be seen in a manner which they could not possibly be in the vacated premises. The library, which is located on one of the upper floors, is lighted from above, and half-way up the walls is fitted with a gallery having a light iron balustrade, by means of which access is obtained to the upper tiers of books. Although the room is much larger than the former library, the greater part of the available space is required for the accommodation of the books. The society will find itself very comfortable in the new premises provided for them by private munificence.

WE regret to observe, from an answer given to a question put by Sir G. Campbell in the House of Commons on Tuesday night, that there is no intention at present of taking any further steps towards the permanent lighting of the British Museum by electric light for evening opening. The excuse is that the evening attendance had not been kept up, the average, which in February was 635 per evening, having fallen March to 367, and in November to 145. No doubt at first curiosity drew a good many persons there who had no serious interest to serve, but we are convinced that if the Museum were known to be permanently open in the evenings it would be a boon to numbers of students, which would be fully appreciated and made use of in the long run. It is not a question merely of the working classes (commonly so-called); there are numbers of professional men who are mostly detained at other work during the day, who would be thankful for the opportunity of study at the Museum without the inconvenience of breaking away from their regular hours of employment..

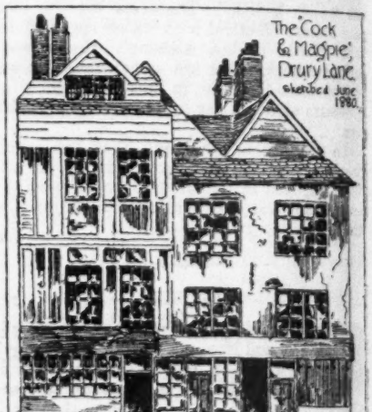
ANOTHER important addition to what may be termed the domestic electric lighting of London will now shortly be made. At a general meeting of the Reform Club held last week it was decided, by a very large majority, that the club premises should be lighted by electric light. Two years ago the same proposition was mooted, but the matter did not proceed further. In the interval of time which has elapsed, electric lighting has become cheaper, and there is no doubt that the delay has saved the members of the club a considerable sum of money. This decision is noteworthy because the Reform Club, in spite of its name, is a somewhat conservative body, largely composed of practical men. It may, therefore, be pretty well assumed that if this system of lighting is adopted by this club, no building, domestic or otherwise, of any size in London will long be without it. While touching on this subject of electric lighting it may be well to call attention to the fact that although the Central Hall of the Law Courts, as well as the courts and court corridors, are lighted by electricity, yet the corridors and wings of the staircases, as well as all the rooms in the east and west wings, where a great amount of important business is transacted,—as, for example, in the chambers of the chief clerks in the Chancery Division,—are still lighted by gas, and that somewhat dimly. Considering that the Law Courts have engines and cellars for the purpose of electric lighting, the entire building should be lighted by this method.

IN days when a number of the working classes seem only desirous of getting as high wages as possible for as little work as possible, it is refreshing to read such a letter as that of a working miner, Benjamin Morris, which was published in the *Times* of Tuesday in regard to the "Miners' Eight Hours Bill." The writer does not scruple to say that the passing of such a Bill would result in a monstrous injustice to the workmen, and that it would be impossible in practice to carry it out; that is for men who, like Benjamin Morris, wish to do their work well and honestly. The writer's position will be best appreciated by the quotation of one or two sentences from his letter:—

"The Mines Regulation Act prohibits any workman from leaving his stall or working place before making it safe; and, in order to comply with the said Act, it is often necessary to stay half an hour and more after the pit has ceased turning coal for the day, and, owing to the nature of the work a miner has to do, this cannot be avoided. You will at once see that if a restriction is put upon the hours a miner is to work he will be compelled to violate one rule in order to comply with another, and the result will be endless litigation. The present rule says that no workman shall place or leave any coal or other material in such a way as to impede the air course. It often happens that just before the time for leaving work a fall of coal will take place, sometimes falling against a pack which has been put up to support the roof, and if left in this position it would greatly impede the air current, and for so leaving it the miner would be liable to prosecution or heavily fined. I have often been compelled to stay three-quarters of an hour in order to comply with the rule. But if the proposed Bill should become law you will at once see that we shall be placed in a great difficulty. . . . . The injustice of the proposed Bill is apparent from the fact that it often occurs that an half-hour's extra work would save the miner a great deal of labour the following day, and also loss. I ask, therefore, what moral right has the law to interfere with me in working at my trade to my own benefit so long as I injure no one by so doing? . . . . In Derbyshire the eight hours system is already recognized, and no one was more surprised than the miners themselves when the question was forced upon them. I am in constant conversation with my fellow-workmen upon this subject, and they all consider it would be unfair to expect to be paid for walking to their work, for this is what the eight hours from bank to bank means, and the objections to this are too numerous to particularise in a letter. Moreover, it would be absolutely unfair to the general public, who have always been ready to put their hand in their pocket when any catastrophe has taken place and funds have been needed. Coal is already dear enough, and to force another advance upon the same would be base ingratitude for past kindness. I observe that some platform orators declare that it will make no difference either in wages or the price of coal, because they say the miners will be able to work with increased activity, a statement which is ridiculously absurd, forgetting that even if this were true it would mean increased danger and loss of life."

It would be a good thing for England if there were a larger proportion of working men (a large proportion we trust there is) animated by the same spirit of honourable pride in doing their duty thoroughly.

HAVING long outlived their younger and more lordly neighbour, Craven House, the two old gabled houses in Drury-lane, near Wych-street, have at last been pulled down. That to the south was conspicuous for its panelled front; the other was formerly known as a tavern by sign of "The Cock and Magpie"—a corruption, perhaps, of "Cock and Pie." When Justice Shallow vows that Falstaff shall remain to enjoy his hospitality, he swears "by cock and pye, sir, you shall not away to night." Here, in all likelihood, we have the origin of the sign. In his "Illustrations to Shakspeare," Douce traces it to a burlesque remembrance of the once solemn oath of fealty or for a deed of chivalry that was taken upon a dish of roasted pheasant or peacock. It has been said that this tavern gave a name to, or took its name from, the Cock and Pye Fields over which Seven Dials was built, by Neale, a speculator, in 1694-5, but there was another tavern of that name, to the north-west, wherein, we believe, this particular connexion should be sought. A copy of S. Rawles' print (1807) of the houses we refer to, together with J. Findlay's water-colour (1850), will be found in the Crace Collection, British Museum. They are included in the views taken by the Society for Photographing Relics of Old London, and in the accompanying description we read:—"A writer in the *European Magazine* for 1807, vol. 52, p. 33,



where also an illustration is given, says that tradition, derived from very old persons, who had long been dead, asserts that this was known as a place of entertainment in the reign of Henry VII. It then looked over the fields. Towards the close of the reign of James I. the houses at the upper end of Wych-street began to be built. Probably no part of the existing houses is of earlier date than the first half of the seventeenth century." Close by lived Nell Gwynne, whom Pepys, on his way to Westminster, saw standing at her lodging's-door in Drury-lane on May 1, 1667, watching some milkmaids with garlands upon their pails, as they danced with a fiddler going before them. The memory, at any rate, of Clarges's Strand maypole is preserved by Maypole-alley, by the side of the Olympic Theatre (just rebuilt) which, together with Craven-buildings, stands on the site of Craven—originally Drury—House.

IN answer to a question in the House on Thursday week last, Mr. Plunket is reported to have said that the old table now placed in the tea-room served for the table of the House from 1706,—when Sir Christopher Wren was employed to reconstruct the fittings and furniture of St. Stephen's Chapel, after the increase of members consequent upon the Union,—to 1834, when it was saved from the fire. This is the table which is depicted in the painting of the House of Commons which the Emperor of Austria presented, in June, 1885, to Her Excellency Lady Paget, wife of our Ambassador at Vienna, for the National Portrait Gallery. In that same year the trustees deposited the picture in the National Gallery, where it has been hung in a basement room of the eastern wing. This picture, painted in London, is the work of Karl Anton Hickel, portrait painter to Louis XVI. and Queen Marie Antoinette. Hickel retained it in his possession on leaving this country for Germany. His representatives sold it, in 1816, to the Emperor Francis I. of Austria. It shows the interior of the house in 1793; and, as some say, in January

or February, a few days after the French had executed their King and declared war against England and Holland. We may suppose, then, that Pitt, who is at the table, is speaking in advocacy of taking up the challenge by sending the Duke of York's expedition to Ostend. The Speaker we take to be Addington. On his right may be recognised Canning; R. Pepper Arden, Master of the Rolls, in his robes, elevated Lord Alvanley in 1801; Dudley Ryder, who succeeded as second Lord Harrowby, and was at that date, we believe, Paymaster-General; Richard, second Earl of Mornington in the peerage of Ireland, created Marquis of Wellesley six years later; and Henry Dundas, afterwards Viscount Melville. Erskine, Sheridan, and Fox are identified amongst the figures on the left side of the chair.

ON the opposite wall hangs the picture,—bought for 2,520*l.* at the Hamilton Palace sale (July, 1882), by the National Portrait Gallery Trustees,—showing an interior in old Somerset House. At a covered table are seated figures of the eleven Commissioners, who on August 18, 1604, ratified a treaty of peace and commerce between England, Spain, and the Archduchy of Austria. There we see named portraits of Charles, first Earl of Nottingham, K.G., Lord High Admiral of our fleet that opposed the Spanish Armada; with the Earl of Dorset, and his successor in the High Treasurership, Lord Cecil of Essendon, who on August 20 of that same year, was created Viscount Cranbourne; William, first Earl of Northampton, Lord President of the Welsh Marches and Lord Warden of the Cinque Ports, who eloped from Canonbury with Sir John Spencer's daughter; and Sir William Cavendish, son to the celebrated "Bess of Hardwicke," from whom he inherited her three noble properties,—Chatsworth, Oldcotes, and Hardwicke, and afterwards first Earl of Devonshire. Amongst the other delegates are John de Velasco, Constable of Leon and Castile, and the Prince of Aremburg, of the Order of the Golden Fleece. According to its inscription and date, the painting should be due to Santoxa de la Crux, 1594, but is considered by Mr. Scharf, upon internal evidence, to be the handiwork of Marcus Gheeraedts, to whom it is officially assigned.

THE exhibition of "water-colour drawings of many-sided nature" (as it is pleasantly entitled) by Mr. Albert Goodwin, at the Society of Fine Arts' Gallery, is a far more powerful collection than that which he exhibited there two or three years ago, and is many-sided in style and variety of power as well as in its subjects. In his preface the artist, referring to the possibility that he had lost something by rushing from one subject to another too erratically, adds that "if there are disadvantages, the pleasure of enjoying the manifold wonder of the beauty of the world has been one that I have had in full." The collection quite answers to the feeling of these words. It is the work of an artist of wide sympathies,—one who is not content with repeating one or two effects that have been thoroughly studied and mastered till the repetition of them becomes a mere business. There are a certain number of those studies of localities expressed in a very delicate scale of colour, of which the artist has produced a good many of late; among them may be mentioned the two views at Buck's Mills, North Devon (1 and 69), "Abingdon" (41), "Bury St. Edmunds" (21), "Iffley Mill" (29), and "Dordrecht" (35), with the brass milk-cans in the foreground. But there are other works of a very different stamp from these; special effects of nature pourtrayed with great power. Among them may be specially mentioned the night effect over the sea in "Hartland and Lundy Island Lights" (7), a most remarkable success in what might be thought an almost impossible subject; "Canterbury" (10), the canal and the old brick walls and timber houses, with the cathedral towers rising above; "Abbeville" (15), a pile of buildings seen in evening light, with a remarkably fine and wild effect of sky; "The Maëlstrom" (47) in illustration of Edgar Poe's tale; "Salisbury Close, Twilight" (51), to which the artist appends the note, "I do not mean to say that all twilights are as blue as this, but this one was;" "The End" (54), a sad-looking evening scene with the timbers of a wrecked ship in the foreground; "Woolacombe Sands" (67), another scene of coast desolation which seems like the end of a romance. Independently of the mere ability in the management of materials which these sketches exhibit, it is not often that one finds so much real poetry in a collection of water-colour sketches.

AN interesting collection of water-colours is now on view at the Dudley Gallery. Mr. James, whose work fills the room (divided for the time into two, the "Gold" and the "White"), has gone both far and near for his subjects. Besides a large number of exquisite flower subjects, there are landscapes from Scotland, the Riviera, and nearer home in Sussex and Rutland. Many are "impressions"—very charming bits of colour, with the freshness of work done at once and on the spot; but there is in most, and more particularly in the subjects in which architecture is prominent, a considerable grasp of effect and detail without unnecessary labour. Perhaps the best are those from "Fort Augustus" (65); a peep into the door and up the stairs at the "Old King's Inn" (60); "Maria's Emporium" and Nos. 15, 22, and 42. These are in the "White room." In the Gold room we noticed "New Romney" (104) and "Sandwich" (113), the latter the better of the two, and a very fresh bit of landscape at Uddimore, Sussex (108). Many more are purely sketches of effect and "values," but the few we have mentioned show what can be done with simple architectural subjects by a competent hand.

MOST readers who visited the Royal Academy this year will remember the picture of "Tulip-culture," representing beds of these flowers of different colours. Mr. Hitchcock, the painter of this work, is one of the Americans who have become artistically French, and a small collection of his paintings, one of which, "Maternité," gained him a gold medal at the Paris Exhibition, is on view at the Goupil Gallery, and is worth a visit, though there are no other paintings equal to the two we have named. In another room at the same house is the set of drawings made by M. Boutet de Monvel in illustration of the novel "Xavière." These were made for reproduction in chromo-lithography, which we presume accounts for their rather hard and precise style, but in point of character and drawing they are admirable, and almost tell the story without the aid of the book.

PROPOSED HERALDIC EXHIBITION IN EDINBURGH.—According to the *Scotsman*, it is proposed, in connexion with the visit to Edinburgh in the summer of 1891 of the Royal Archæological Institute of Great Britain and Ireland, to hold an exhibition illustrative of Heraldry in its various aspects. The exhibition will be divided into two sections—a historical section, dealing generally with objects of heraldic interest; and a decorative section, illustrative of heraldic painting and delineation as a branch of the Fine Arts. Mr. A. Ross, F.S.A., Scot., Marchmont Herald, has undertaken the secretaryship of the former section, which will appeal mainly to the historical and genealogical student; and the latter section, which it is hoped will be of interest to decorative and other artists, will be under the more immediate direction of Dr. R. Rowand Anderson, architect, and Mr. J. M. Gray, curator of the Scottish National Portrait Gallery. Mr. Thomas Ross, architect, joint author of "The Castellated and Domestic Architecture of Scotland," has undertaken to superintend the production of a series of drawings and reproductions of painted and other heraldic decorations of old Scottish castles and mansions.

THE MODEL FOR THE NEW FAÇADE OF MILAN CATHEDRAL.

OUR readers may remember that one of the conditions attached to the first competition for the new façade for Milan Cathedral was that the finally successful competitor should have a wooden model of his proposed façade made, to a scale of one-twentieth the size of execution; and that until this was done he was not entitled to the second half of the amount of the premium, the first half of which was payable on the announcement of the choice of the jury. The model of the late Signor Brentano's design, which has been made in accordance with these conditions, is now on view at Milan. The model, we should add, according to the terms of the competition, was made at the cost of the Cathedral administration; the architect, or his representative, giving only his skill and supervision to the work. Moreover, the model of the new façade was to be made in relation with the old model of the cathedral now existing in the offices of the administration.

This same ancient model is a very singular affair. It is of course of the scale of one-twentieth already notified as the scale for the new model, and is executed in wood in a rough-and-ready manner which sufficiently betrays the epoch of its execution; an epoch in which Gothic had begun to be interpreted in a somewhat arbitrary manner. Nevertheless the old model is worth a visit. It is to be found in the cathedral offices, at No. 1, via Arcivescovado.

According to the conditions, Brentano received the 20,000 lire, the half of the premium, when he was announced as the successful competitor, and had then to proceed to direct the construction of the model. It should be borne in mind, however, that his design was not accepted by the jury without some reservations. They commenced by expressing great admiration for the portals in his façade, to which perhaps they were specially led by the fact that there does not exist at present anything like a decent entrance portal to the cathedral. The transepts have a kind of lean-to of comparatively modern date, and at the side of the cathedral is a small modern entrance of anything but monumental character. It is no wonder therefore that the jury were struck with this point in the design, and said that "to create a central entrance and another at each side, all of dignified character, was a problem which Signor Brenlano had perfectly solved;" but they went on to express the opinion that in order that the rest of the design should harmonise with the entrances, it was desirable that the central portion of the design should be somewhat raised.

The desire thus expressed was naturally equivalent to a direct instruction; but unfortunately, from whatever reason, it has not been attended to. The architect had not had time to study this proposed alteration seriously, or to leave any adequate drawings for it. He did however make some attempt at meeting the criticism of the jury. He made three sketches of the façade with the centre portion raised, but these were not, as he himself said before his death, to be regarded as definitive studies for the modification of the original design, about which in fact, he had not been fully persuaded himself. He did not himself believe the alteration to be necessary and was disposed to wait till he saw better reasons, as he thought, given for it, and especially till he saw the effect of the model. Possibly he would have made two models, one representing the original design, the other the modification.

Brentano sent his drawings to Siena as an *envoi* in connexion with the travelling studentship which he had gained in the Gori-Feroni competition some years before. Only the photographs of these drawings, which had been taken by the order of the cathedral administration, remained at Milan.

Of the modified drawings previously referred to, no notice has been taken in making the model, which is simply a reproduction of the first design. It is the nature of models in relief to bring out defects in a design unsuspected when it was only shown in drawings, and it has been so in this case; the model in relief producing an effect very different from that conveyed in the picturesque and cleverly-executed drawings.

The model shows even more plainly than the drawings, in the first place, the necessity for the raising of the centre, not only for æsthetic but for what may be called organic structural

reasons. In the central portion there is a grand window, suggested by those in other parts of the building; but no other window in the cathedral is so far below the vault as this one would be, and therefore it is out of harmony with the whole architectural ordinance of the building.

The great portals, which were so much admired in the drawings, as shown in the model are the objects of a great deal of criticism. The portals, as portions of a façade, have two faults; the first in regard to their connexion with the surbase (which only applies however to the central one); the second in regard to their gables, which are out of character with the style of Italian Gothic which belongs to Milan. M. de Geymüller, who has written an admirable critique on the design, goes so far as to say that these gables would hardly be more out of place in front of the Pantheon than in front of Milan Cathedral. Another mistake which appears to me to be revealed in the model is that the portals are too much crowded and broken up with a multitude of little columns and other small details, in keeping with Gothic of another school no doubt, but out of keeping with Milan, which has a character of its own, a kind of compromise between northern and Italian Gothic, and which is precisely what gives the cathedral a good deal of its special interest, as also, it must be admitted, some of its greatest faults. And one of the characteristics of the building is that there is plenty of wall surface around and in connexion with the windows and doors generally, giving them so far a monumental effect; and there is in fact, hardly a regular shaft or colonnette in the whole building. And the model of the design shows clearly that in comparison with the detail of the existing building, the central portal is in too high relief and the details too *prononcés*.

The foregoing may be taken as a fair expression of the general opinion among competent critics in regard to the effect of the design as seen in the form of a model; and while it was formerly said that any new façade to Milan must be logically composed in relation to the interior, the effect of the model, in which this principle has been adhered to, is rather to support the judgment of those who said from the first that the new façade ought not to be restricted by the lines of the existing building.

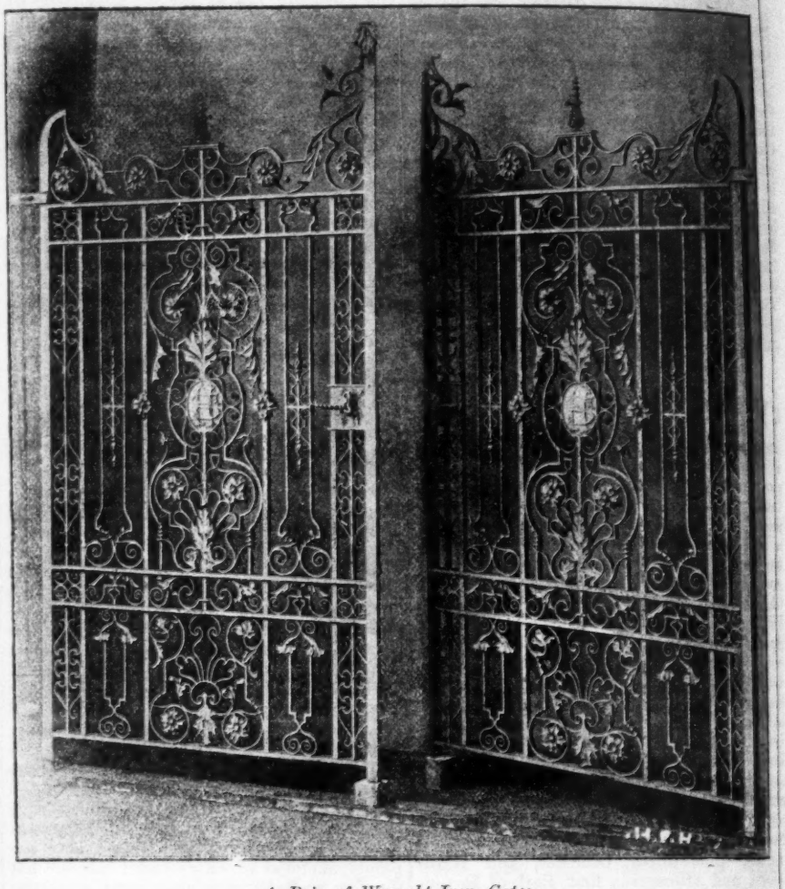
The case no doubt would be very different but for the lamented death of the young architect. I remarked in a former communication that if the model did not give satisfaction, the question of the façade would remain in the region of projects, and the design of Brentano would merely go to swell the number of unexecuted designs for a façade for the cathedral. I do not believe, and the majority of Milanese who take interest in the matter do not believe, that the proposed façade will be executed, at all events within any short time. As before observed, it might have been different if Brentano had lived; but now there are so many difficulties, artistic personal, and financial, that it seems unlikely they can all be surmounted.

It may be added, before quitting the subject, that the model referred to has been admirably executed by the Milanese carver, Signor Brambilla, at a cost of 15,000 francs. The work has occupied just a year in execution.

A. Melani.

The English Iron Trade.—There is no improvement in the English iron market, and, if anything, its tone is even quieter than it has been during the past few weeks, the approach of the holidays having also, no doubt, a share in the quietness ruling. The downward course of pig-iron has not been arrested, warrants practically ruling the market. The Glasgow market has again been flat, and Scotch warrants are about 2s. a ton lower. In Middlesbrough pig-iron, the drop has been 1s., and west coast hematite has lost in value to a similar extent. In Lancashire almost any prices are taken to effect sales, especially of forge pig. Manufactured iron and steel are in no better demand, and easy in tone, concessions being frequently made to accelerate business. Shipbuilders keep steadily at work, and are still receiving fresh orders, although the bulk of the tonnage ordered is gradually decreasing. Engineers continue well employed.—*Iron*.

The Brussels Seaport Scheme.—The municipality of Brussels has decided that, in order to carry out the scheme of making Brussels a seaport through a canal, a limited company, supported by the city, is to be formed with a capital of twenty-two million francs.



A Pair of Wrought-Iron Gates.

WROUGHT-IRON GATES.

These gates have been recently made on commission by Messrs. Hill & Smith, the design having been made in their house, by Mr. H. P. Hodkinson. They are entirely hammered work.

SYRIAN ARCHITECTURE—THE JEWISH TEMPLE.*

Probably the best use we can make of the Vision in Ezekiel is to unite it with the statements in Kings and Chronicles, and with those in Josephus and the Talmud: we shall in this way arrive at a very fair idea of the appearance and plan of the latest temple of all, that of Herod. For there can be no doubt that the final temple followed the lines of the two earlier temples, only that it was much more ornate than they, and had a larger extent of outer court.

The two subjects on which Ezekiel enters with some detail are the gateways to the two courts and the plan of the temple and its adjuncts. To take his description of the temple first, we learn that there was an open porch 30 ft. wide (taking the cubit at 18 in.). No height is there given, but, if we refer to the Talmud, we find that it states the height as 60 ft. We have thus an opening 60·0 by 30·0, which we may turn into a "portico in antis" by introducing the two columns, Jachin and Boaz, which we are told in I. Kings were set in the porch. They thus had some constructional purpose to serve in supporting the porch lintel. What confirms this theory is the height assigned to the columns in Chronicles,—viz., 60 ft., with shaft and capital,—which is just the height of the porch given in the Talmud.

What did these columns support? The Talmud tells us that the porch had five carved oak beams as lintels, with stones in between, and that these beams increased in length by one cubit from the lowest to the highest, the highest being 30 cubits long. This would make the lowest beam 22 cubits, so giving it one cubit wall hold. There is, moreover, a statement that the front of the temple shone from afar with the reflection of the gold which covered it, which seems to suggest that the five carved oak beams were covered with gold hammered to the form of the carving, and thus casing them in from the action of the weather. That wood, and not stone, should be used for the lintels, seems reasonable when we consider the enormous size of stone which would have been required to cover a 30 ft.—or with the columns—an 18 ft. span.

The repetition of the beams is also rational, inasmuch as it relieves the lower beam of much of the superincumbent pressure, in the same manner as the four lintels of the great pyramid mutually aid in relieving the true lintel over the chamber there. The gradually-increasing lengths of the lintels is a master stroke of æsthetic effect, as the result would be a form of lintel resembling a crown, somewhat like a stone which surmounts a lintel of a temple at Baal-Zimmon.

Mr. Fergusson's theory was that the columns and lintel assumed the form of something like the Sanchi Tope, or one of the Japanese Torü, so common in front of their temples, and so in his restoration of the temple he devised a screen of the Torau form, detached from the porch. He finds confirmation of this in the Talmudic statement that transverse beams were placed to tie the framework and prevent it from falling; but the fact is, the ties would be required in the other case also; and he overlooks the statement of the Talmud concerning the layers of stones between the beams, which would not, of course, be required in a detached piece of framework, but *would* be needed if it was incorporated with the wall.

Another oversight Mr. Fergusson makes is in taking the diameter of the columns as 18 in., because this, he thinks, would accord with classic proportions; he does not seem to have observed the passage in I. Kings and in Jeremiah:—"A line of twelve cubits did compass them about,"—that is to say, the columns were 18 ft. in circumference, and therefore 6 ft. in diameter.

The next statement of moment in Ezekiel is, that there were three stories of chambers entered by a passage that ran round the

* Portion of Ninth Lecture of course on History of Architecture, delivered by Mr. Aitken, at Heriot-Watt College, Edinburgh, Monday, December 8, 1890.

temple, and which had side doors to the north and south at the east ends of the passage; these passages were repeated in the floors above, and they were approached, it would appear from Ezekiel xli., 7, by stairs, probably in the thickness of the temple walls. Mr. Fergusson reverses these passages, and places them outside the chambers, converting them into a series of open galleries: a very unsuitable form of construction for winter in so exposed a situation, and one that, moreover, shuts out the light from the windows of the chambers.

As regards plan dimensions, Ezekiel gives the temple walls as 6 cubits thick, the passage on lower floor, 5 cubits; the chamber wall, 5 cubits; the chambers themselves, 4 cubits; and the outer wall, 5 cubits; doubling this for the two sides, and adding the 20 cubits for the width of the holy place, makes up the 70 cubits mentioned by the prophet. Longitudinally, the dimensions taken from Ezekiel are: Porch, 11 cubits; wall to holy place, 6 cubits; holy place, 40 cubits; vail, 2 cubits; Holy of Holies, 20 cubits; adding to all these the dimensions of walls, passage, and chambers at the end, results in a total length of 104 cubits. Ezekiel gives 100 cubits. He also mentions a figure of 90 cubits, which evidently refers to the length of the side chambers, which were shorter by the depth of the porch than the total length: if we therefore deduct 11 cubits, being the depth of the porch, from 104 cubits, there remain 93 cubits, a dimension sufficiently near to Ezekiel's 90 cubits, as the 104 cubits is to his 100 cubits, in order to warrant the accuracy of our plan, because it is evident that Ezekiel did not attempt to record fractions of figures where general dimensions were concerned.

Another point of confirmation is Ezekiel's statement of the number of side chambers as thirty: he mentions the length of the chambers as 20 cubits; this gives four chambers at the sides and two at the ends, which, multiplied by the three stories, makes up the thirty.

Another matter in which both Mr. Fergusson and M. Chipiez have taken alarming liberties with all the authorities, sacred and profane, is in the introduction of *twin* towers at the east or entrance end of the temple; for this there is not the slightest authority. On the contrary, we are expressly informed in the Chronicles account that there was a *single* tower 120 cubits high. The authority which these gentlemen trusted to, is the Talmudic statement that the porch had chambers projecting 15 cubits from it to the north and south, called the house of the instruments of slaughter; but it did not necessarily follow, as they assume, that these *chambers* reached to the height of 120 cubits: more probably they did not exceed the height of the first tier of side chambers, and would thus play a more efficient part in the general grouping than the ungainly arrangement which the assumed double tower plan would lend itself to.

ARCHITECTURAL SOCIETIES.

THE ARCHITECTURAL ASSOCIATION (LONDON).—At the meeting of the Advanced Class of Construction and Practice on Wednesday evening last, Mr. Maximilian Clarke read a paper with "Quantities" as the theme, taking the following heads for his remarks:—"Should quantity-taking be taught at the Architectural Association? To what extent should the subject be studied by architects? Remarks upon quantities as at present prepared by quantity surveyors. Remarks upon the difference between the London and country methods of preparing quantities." Mr. J. E. Drower was the Special Visitor, and added much to the information contained in the paper.

LEEDS AND YORKSHIRE ARCHITECTURAL SOCIETY.—A *soirée* in connection with this society took place on the 8th inst., about fifty members being present. Mr. Clibborn, of Birkenhead, gave a description of scenes in Normandy, illustrated by some lantern slides, contributed by Mr. Thompson, of Liverpool. Later, the evening was passed with music. Mr. W. H. Thorp (president) occupied the chair.

YORK ARCHITECTURAL ASSOCIATION.—The eighth session of the York Architectural Association will be opened on Thursday evening next, the 18th inst., when an address by Mr. B. Priestly Shires, on "Domestic Life of the Middle Ages, as shown by its Architecture," &c., will be given.

GLASGOW INSTITUTE OF ARCHITECTS.—At a general meeting of the Glasgow Institute of Architects, held on the 2nd inst., the terms and conditions of competition for designs for workmen's dwellings in High-street recently issued by the Improvement Trustees were under consideration. The matter being one of importance in view of its bearing on future competitions, the Institute appointed a committee to frame a letter to the Town Clerk on the subject, and, if necessary, to wait upon the municipal authorities as a deputation from the Institute.

GLASGOW ARCHITECTURAL ASSOCIATION.—The usual monthly meeting of this Association was held on the 3rd inst., Mr. W. J. Anderson in the chair. A paper was read by Mr. William J. M'Illwain on "Ornament." The right qualities in coloured, carved, and moulded ornament, and the province of each and all, were defined, the writings of Ruskin, Professor Dresser, and others being laid under contribution in the discussion of these questions. With regard to the exact prototype of forms met with in the art of all nations, a *résumé* of the opinions held was given. The essayist gave a review, with analysis, of the great historic styles of ornament, showing that in some, symbolism was a potent influence, in others the æsthetic taste alone was appealed to—*e.g.*, Egyptian and Renaissance. In some, nature was copied with but little intervention of conventionality, in others the abstract laws of form and colour in beast and flower alone imitated; Gothic and Saracenic being examples of these opposites. A short discussion, opened by Mr. A. Muirhead, followed, at close of which the customary vote of thanks was passed.

THE ARCHITECTURAL SECTION OF THE PHILOSOPHICAL SOCIETY OF GLASGOW met on the 8th inst., when Mr. Campbell Douglas, F.R.I.B.A., gave some notes on "The Architecture of the Iberian Peninsula." Among other things, Mr. Douglas called attention to the fact that it is in the east end of the city, where the Moorish citadel and the Christian cathedral are close to each other, that almost the only architectural interest of old Lisbon can be found, for apparently something in the geologic strata of this part has offered more resistance to the severity of the shocks of the great earthquake than in the western parts. It is also noticeable that the Gothic towards the east end of the cathedral, as well as of the ruined Carmo Church further west, is of a fine, severe type of Early Pointed work. Mr. Douglas referred to the manner in which a large proportion of the houses are faced or veneered with glazed tiles, generally of a bluish colour, and known as "azulejos," on account of their being originally of an azul or blue colour, although that is not now universally adhered to. As houses veneered with tiles in this way have only to be well rained on to appear clean and fresh, their introduction would do much to break the dismal monotony of dirty grey in our streets. Mr. Douglas advocated that something might be done to make our footways more interesting. He was much struck in Lisbon with the many beautiful footpaths made in the various mosaic patterns of a brownish black and creamy white. The black is a whinstone, and the light-coloured a carbonate of lime, resembling in character the stone used by lithographers. Elegant and simple yet effective patterns are everywhere to be seen, and in one of the principal thoroughfares for shops—the Chiado—the number of the house is frequently worked into the design. One of the largest squares in Lisbon and some of the smaller ones are admirably decorated in this way. After showing that the building laws which were enacted by the Marquis de Pombal after the great earthquake of 1755, in order that the construction of houses might better enable them to resist the shocks of earthquakes, have been so far altered and modified that they no longer answer their original purpose, but rather make matters worse, Mr. Douglas proceeded to give an account of excursions to the great Church and Monastery of Alcobaça, as well as to those of Batalha. The second half of his paper was occupied with an account of a short visit to Spain, in which he rapidly sketched its history in Moorish and Christian occupation, in so far as each lent its own complexion to the development of its architecture. In Madrid there is little architecture worthy of attention. During the course of the lecture between thirty and forty limelight illustrations were shown, which had been specially prepared. Votes of thanks were accorded to the lecturer, and to the chairman, Mr. James Thomson, F.R.I.B.A.

ARCHÆOLOGICAL SOCIETIES.

BRITISH ARCHÆOLOGICAL ASSOCIATION.—At the meeting of this Association on the 3rd inst., Mr. J. W. Grover, F.S.A., in the chair, Mr. Sheraton exhibited a mass of lead which had been found in the thickness of part of the walling of the Roman camp at Carnarvon, where it had apparently been deposited in molten state from some conflagration. Mr. Bodger described some Roman coins which have been found at Woodstone Hill, near Peterborough. Mr. Loftus Brock, F.S.A., announced the discovery of a huge "Sarsen" stone, which has been found beneath No. 71, Moscow-road, Bayswater, to all appearance worked to a fairly smooth surface. It is supposed to weigh nearly twenty tons, and when erect it would have been a conspicuous object from the Roman road from London to Silchester, the site of which is the present Bayswater-road. Miss Stoddart having recently presented a fine collection of rubbings of brasses, about 100 in number, a few of them were exhibited to the meeting. They are of additional interest from the fact that they were taken about fifty years ago, and several changes and losses are recorded. Mr. Oliver described a curious inscribed slab in Ashridge Chapel, representing a priest, John Stone, ob. 1395, which appears to have had prior use for some other person. A paper was then read by Mr. Davis on a brass to the memory of John Semis, Mayor of Gloucester, *temp.* Henry VIII., and Agnes, his wife, which had previously existed in the Church of St. John, Gloucester. It is described in Rudder's history, but had long since disappeared. During some recent restorations portions of a brass were discovered among some rubbish in a vault, and these have now been identified as having belonged to the lost brass in question. The second paper was descriptive of the celebrated Epinal Glossary, and was by Mr. W. de Gray Birch, F.S.A. It was compared with the Corpus Christi and Erfurth Glossaries, and specimens of the Early Saxon words were laid before the meeting.

SOCIETY OF ANTIQUARIES OF SCOTLAND.—The first ordinary meeting of this Society for the present session was held in the Library of the New Museum, Queen-street, Edinburgh, on the 8th inst. The Marquis of Bute, Vice-president, presided. The first paper, which, in the absence of the author, was read by Sir Arthur Mitchell, was entitled, "Fac-similes of the Scottish Coats of Arms emblazoned in the Armorial de Gelre, with notes," and was by Mr. Archibald Hamilton Dunbar, F.S.A., Scot. In the second paper, Dr. D. Christison, Secretary, gave an account of the excavation of a curious fort, locally known by the name of Suidhe Chennaidh, situated on the side of Loch Ame, near Kilchrenan. With reference to the stone forts which were so numerous both in the Highland and Lowland districts, whose typical structure was yet comparatively unknown, much remained to be done. He described in detail the results of the excavation, which showed the fort to be of circular form, with a solid wall, containing neither chambers nor gallery, but having on the inside a series of step-like platforms. The next paper was an account of the excavation of two cairns on the estate of Aberlour, Banffshire, the property of Mr. J. R. Findlay, of Aberlour, by Dr. Joseph Anderson, Assistant Secretary and Keeper of the Museum. The first cairn was about 40 ft. in diameter, having its cutline marked by a circle of stones of larger size than those composing the body of the cairn. The chamber in the centre of the cairn had been approximately circular, and formed of long slabs, set on end edge to edge, enclosing a space of about 5 ft. in diameter. The floor of the chamber had been much disturbed, but in its upper layer there were found fragments of urns of the usual character of the sepulchral pottery of the Stone Age, and an undisturbed deposit of ashes and charcoal containing the burnt bones of a cremated interment. The cairn being chambered, it is to be referred to the Stone Age, but to the latter part of that period, when cremation was in use. The second cairn was about 45 ft. in diameter. No chamber or cist was found in it, but the surface of the ground underneath was covered with patches of charcoal and ashes, and at a depth of 3½ ft. under the base of the cairn there was a large deposit of ashes and charcoal, with traces of burnt bones. The fourth paper was a notice of the discovery of a cist and the opening of two cairns at High Banks, Kirkcudbrightshire, by George Hamilton, Ardendee, F.S.A., Scot. The last paper was a notice

by Mr. John G. Winning of a cist discovered at Eckford, in Roxburghshire, in February last, being the third that has been discovered in the locality since 1885.

Illustrations.

CAMBERWELL GREEN BATHS AND WASH-HOUSES.

THIS design, of which we publish two views, interior and exterior, was the one selected by the Camberwell Baths and Wash-house Commissioners (acting under the advice of Mr. Charles Barry, F.S.A., their professional assessor) in the recent limited competition.

As in the case of the baths to be erected on the East Dulwich-road site, by the same architects, the whole of the requisite accommodation for bathers has been provided on the ground floor, and the simplicity of plan thus ensured, in addition to securing the utmost possible convenience to the public making use of the establishment, facilitates an economical system of administration with efficiency of working, easy and effective supervision, and minimum cost of construction.

The men's and women's baths have separate entrances, between these is placed the check-taker's office, so that one person can take the money from both sexes and classes.

The following slipper bath accommodation has been provided:—

24 men's first-class slipper baths.
40 „ second-class „
12 women's first-class „
20 „ second-class „

Each of these sets or groups (all amply lighted and ventilated) is complete in itself, with waiting-room, w.c., &c., and each attendant in charge of a department can easily supervise the adjoining one by means of the direct through communication that has been provided.

The first-class swimming bath for men is near the men's entrance, with direct access from it as well as from their private baths. Its size is 120 ft. by 35 ft.

As this bath is on certain days to be set apart for women, a separate access thereto has been provided from the first-class women's waiting-room, which room, like the men's first-class waiting-room, would be shut off from the swimming bath whenever necessary, in order to insure absolute privacy to the swimming bath.

The men's second-class baths are also conveniently planned, and are directly approached by a wide corridor from the men's separate entrance.

Eighty-one dressing boxes are provided for the men's first-class swimming-bath, whilst for use in connexion with the second-class swimming-bath (which is of similar size to the first-class bath—viz, 120 ft. by 35 ft.), there are 103 dressing-boxes.

The whole of the accommodation required has been provided, including a superintendent's corridor for the easy supervision of the whole of the departments, and a gallery to the first-class bath, in connexion with which there are unusually spacious staircases, both for convenient access thereto, and in order to meet the stringent regulations now in force for facilitating free and rapid egress in case of panic.

In view of the utilisation of the first-class swimming-bath as a public hall, it has been thought desirable to connect it by means of swing folding-doors with the corridor leading direct to Harvey-road, and in accordance with the instructions, two artistes' retiring-rooms, fitted with lavatories, have been provided. These rooms are in communication with the north end of the first-class swimming-bath, where it is proposed to place the platform for the performers, who would probably enter the building from the Harvey-road. All or any of the waiting-rooms adjoining the entrances from Artichoke-row would be available for cloak-rooms; the refreshment-room being placed, for convenience of service, on the first floor, immediately adjoining the kitchen.

The wash-house department has been placed at the end of the site next Harvey-road, from which it is directly accessible, and has seventy-eight washing compartments.

The boiler-house, coal store, &c., with good external access from Harvey-road, are placed in the basement of this department, and would be separated from the upper part by fireproof floors.

As the proposed building, in addition to having its front set back some 22 ft. from the main street, adjoins some very lofty buildings, the authors considered it might be advantageous to incorporate a tower in the design for the principal façade, but this architectural embellishment could be omitted, if thought desirable, without materially injuring the design.

It is proposed to erect the buildings with sound, hard, well-burnt bricks.

The fronts abutting on Artichoke-row and Harvey-road would be faced with the best red bricks with buff terra-cotta dressings. The entrance steps and all staircases would be of granolithic concrete, and all ballusters, &c., of iron. All drains to be glazed stoneware pipes, with Stanford's patent joints and embedded in concrete.

The internal walls throughout would be plastered or faced with white Suffolk bricks, and the insides of the swimming-baths lined with white, glazed bricks.

All floors and passages would be of fireproof construction, and the flooring round the swimming baths would be finished with ornamental tiling, and a curbed and sunk channel would be formed in order to prevent the surface water from passing into the baths.

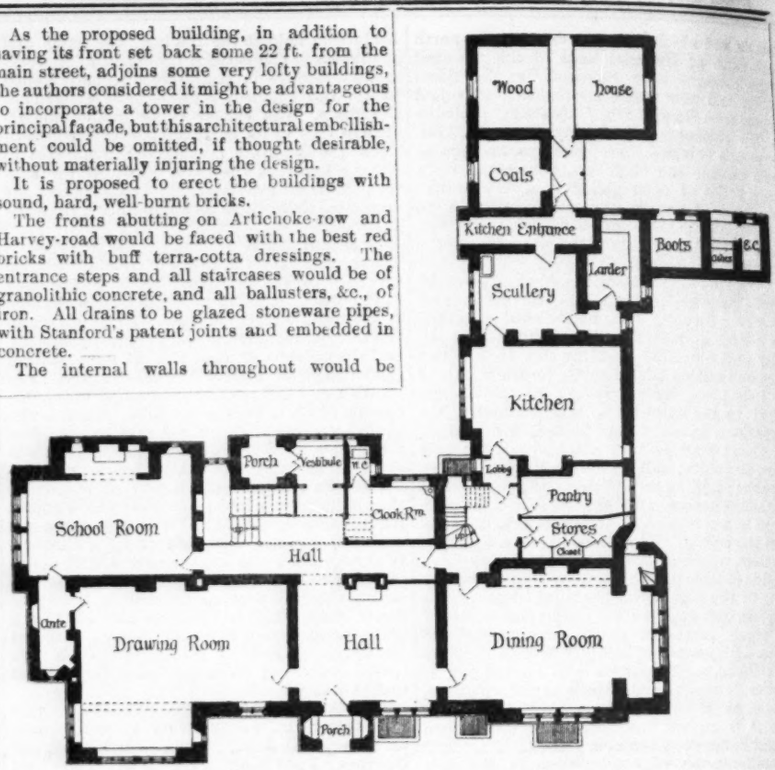
The 1st class private baths would be of porcelain, and the 2nd class of enamelled iron.

The front roofs would be tiled with Broseley tiles, and the roofs of the swimming baths covered with the best Bangor duchess slates.

The heating apparatus would be placed in the basement of the wash-house block, and the tanks for the storage of water would be placed in the tower of the front block.

A service laundry is provided, which would be thoroughly fitted up with every requisite appliance, and spacious drying closets are provided.

The estimated cost of the proposed buildings is about 24,000*l*. Messrs. Spalding & Cross are the architects.



Ground Plan

Plan of Residence at Street.

RESIDENCE AT STREET, SOMERSET.

THIS house, of which two views (the *entrance* front and *garden* front) are given, is situated on the brow of a gentle hill, and commands extensive and varied views of the surrounding country, including the celebrated Glastonbury High Tor and "Weary-all" Hill.

The garden front is occupied by the drawing-room (on the left of porch in garden-front view), the inner hall, and the dining-room. The pantries, kitchen, and offices extend behind the dining-room; the kitchen entrance is by the porch on the left-hand side in *entrance*-front view. The principal entrance is under the oriel window here. On the right, the gable, with chimney rising from the ground, is the school-room or library, and a chimney-corner is arranged inside. The bed-rooms are on the first-floor, with spacious attics over these.

Convenience of planning and general comfort in the apartments have been very carefully studied, and the elevations designed simply expressing the purposes of the interior, and as far as possible in conformity with the characteristic domestic architecture of the county.

A conservatory, vineries, laundry, stables, and a lodge have also been built. The materials for walling are local blue lias stone with Ham Hill stone dressings. Bridgwater tiles for the roofs. The dining-room is oak panelled throughout, and the hall, staircase, &c., are also of oak. Special heating apparatus to supply warm and hot air has been arranged.

Mr. H. Hawkins, of Glastonbury, is the builder, and has nearly completed his contract. Mr. George J. Skipper, of Norwich, is the architect.

SALCOMBE CHURCH, DEVON.

THE illustration shows the east end of this small but solid-looking church, which has recently been erected at Salcombe from the designs of Mr. J. D. Sedding.

TWO BRASSES OF KNIGHTS.

THE brass of Lord William de Bryene, Seal, Kent, 1395, belongs to the camail period.

The head of the figure in the bascinet rests on the helm with the crest and mantling. The sword hangs from the baldric, which is decorated with square roses. Over the head are two shields of arms, and a marginal inscription is round the slab. The evangelistic symbols are placed at the corners.

The brass of Sir Reginald Cobham, Lingfield, Surrey, 1403, belongs to the Transition period between the camail period and the Plate and Taces period. The former period is seen in acutely-pointed bascinet, and the camail, and the later in the cuirass and taces.

Beneath the bascinet is the helm, with the crest orb and mantling. A fillet of roses is placed round the head-piece. The armour on the arm is ornamented, and also the cuffs of the gauntlets. At the armpits there are fringed armholes, beneath which mail is worn, which may also be seen at the knees and insteps. The sword hangs in a socket which is attached to the baldric which passes across the waist. The scabbard is ornamented with a pattern similar to that on the scabbard of Sir W. de Tendring (see *Builder*, November 22). Shields of arms are placed on either side of the figure, and a marginal inscription completes the composition.

In "Burtell's Brasses," p. 61, there is an illustration of this, showing that the crest, orb, shields, and the hilt of the sword and dagger were then lost. They have since been restored.

A. O.

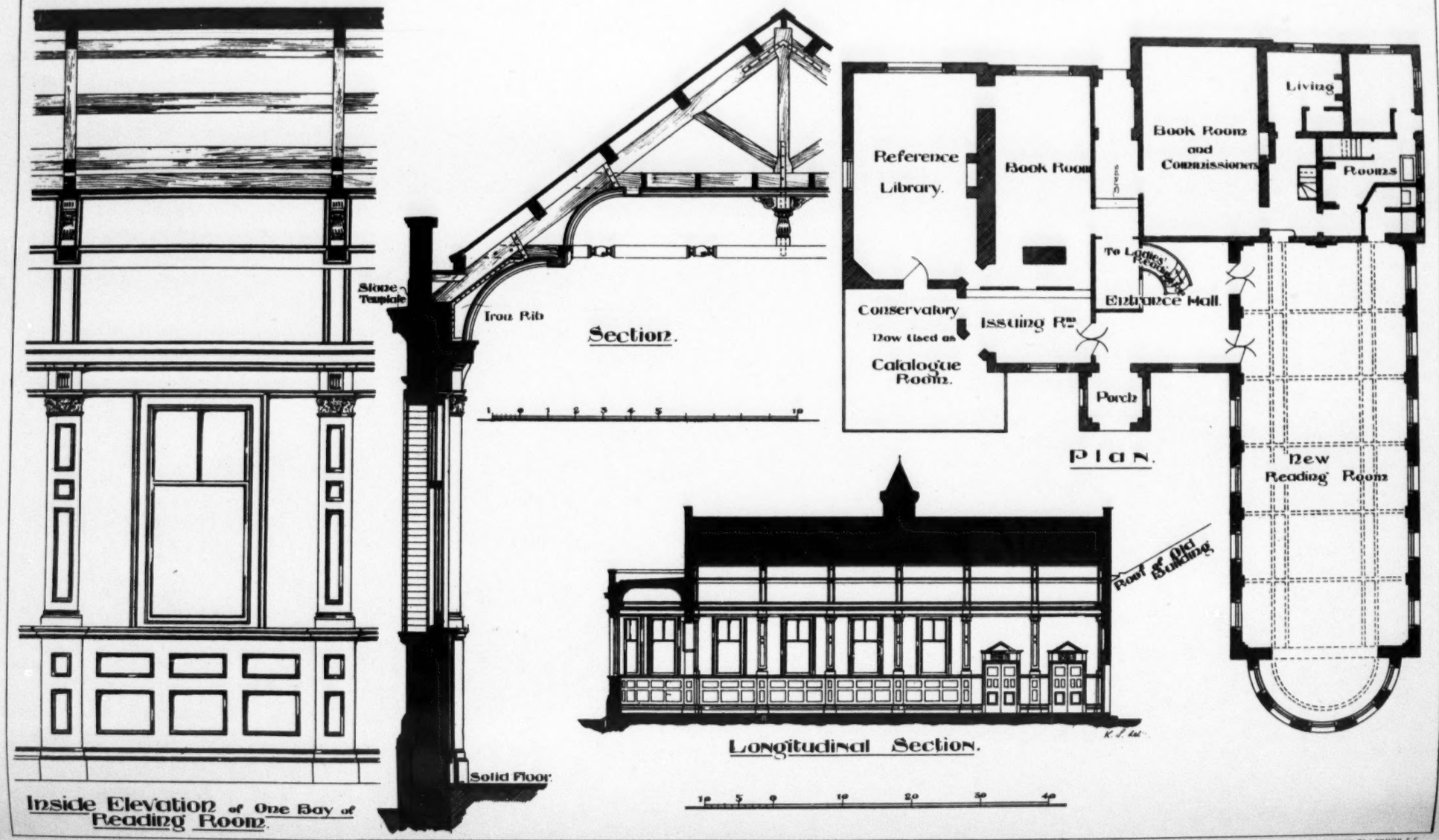


PHOTO-LITHO. SPRAGUE & Co. 82, MARTINS LANE, CANNON ST. LONDON E.C.

WANDSWORTH FREE LIBRARY, NEW READING ROOM.—Messrs. Roger Smith & Gale, Architects.

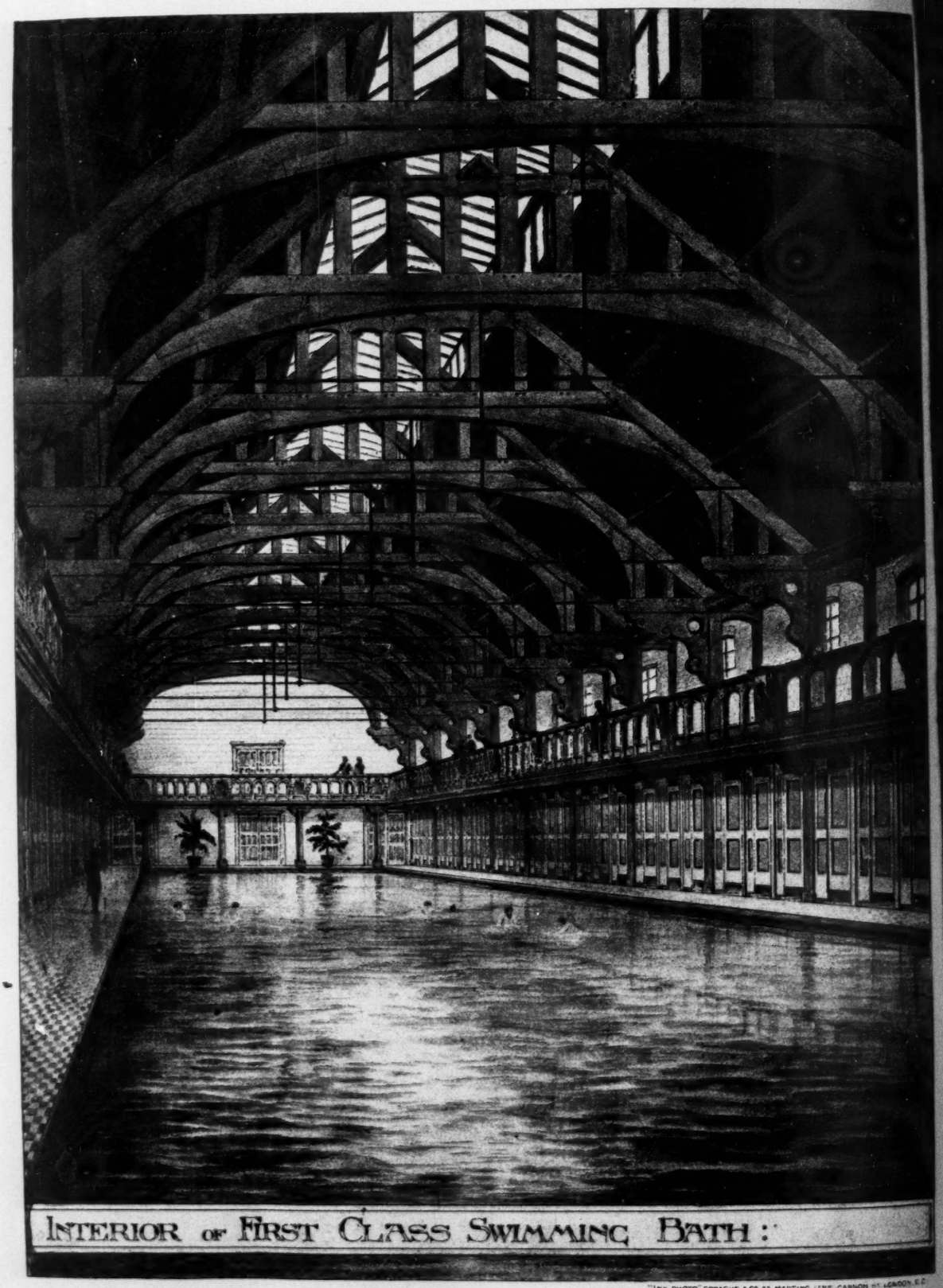
WANDSWORTH FREE LIBRARY. NEW READING ROOM.—MESSRS. ROGER SMITH & GALE, ARCHITECTS.

GARDEN FRONT.

ENTRANCE FRONT.

"INK-PHOTO," SPRAGUE & Co., 82, MARTINS LANE, CANNON ST., LONDON, E.C.

RESIDENCE, STREET, SOMERSET.—Mr. G. J. Skipper, F.R.I.B.A., Architect.



"TINK-PHOTO," SPRAGUE & CO. 62, MARTINS LANE, CANNON ST. LONDON, E.C.

SELECTED DESIGN FOR CAMBERWELL GREEN BATHS.—Messrs. Spalding & Cross, Architects.

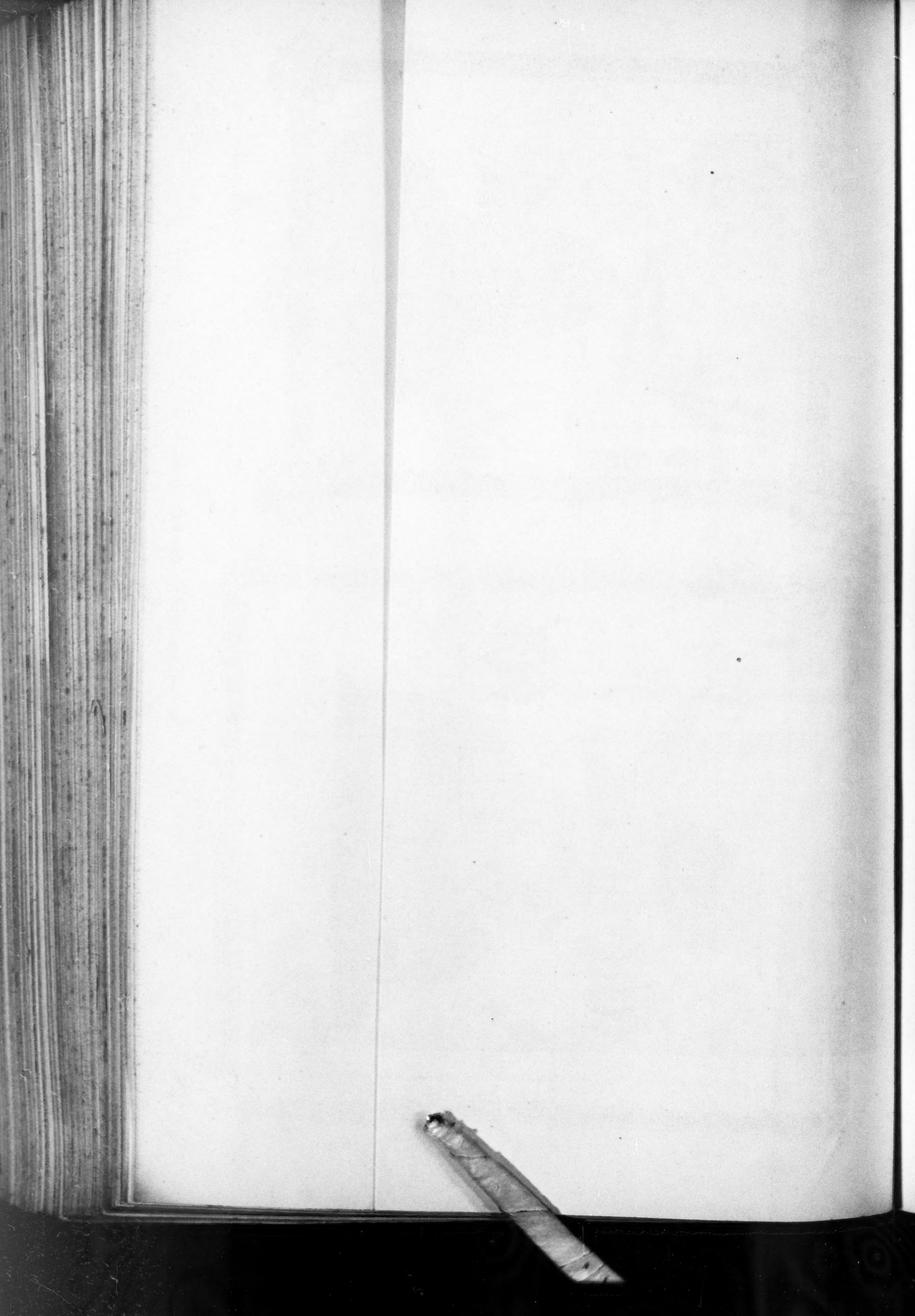
quondam
Willus de Bryene miles
sup
hic
iacet
+
Anno
dñi
millimo
ccc
xxxvij°

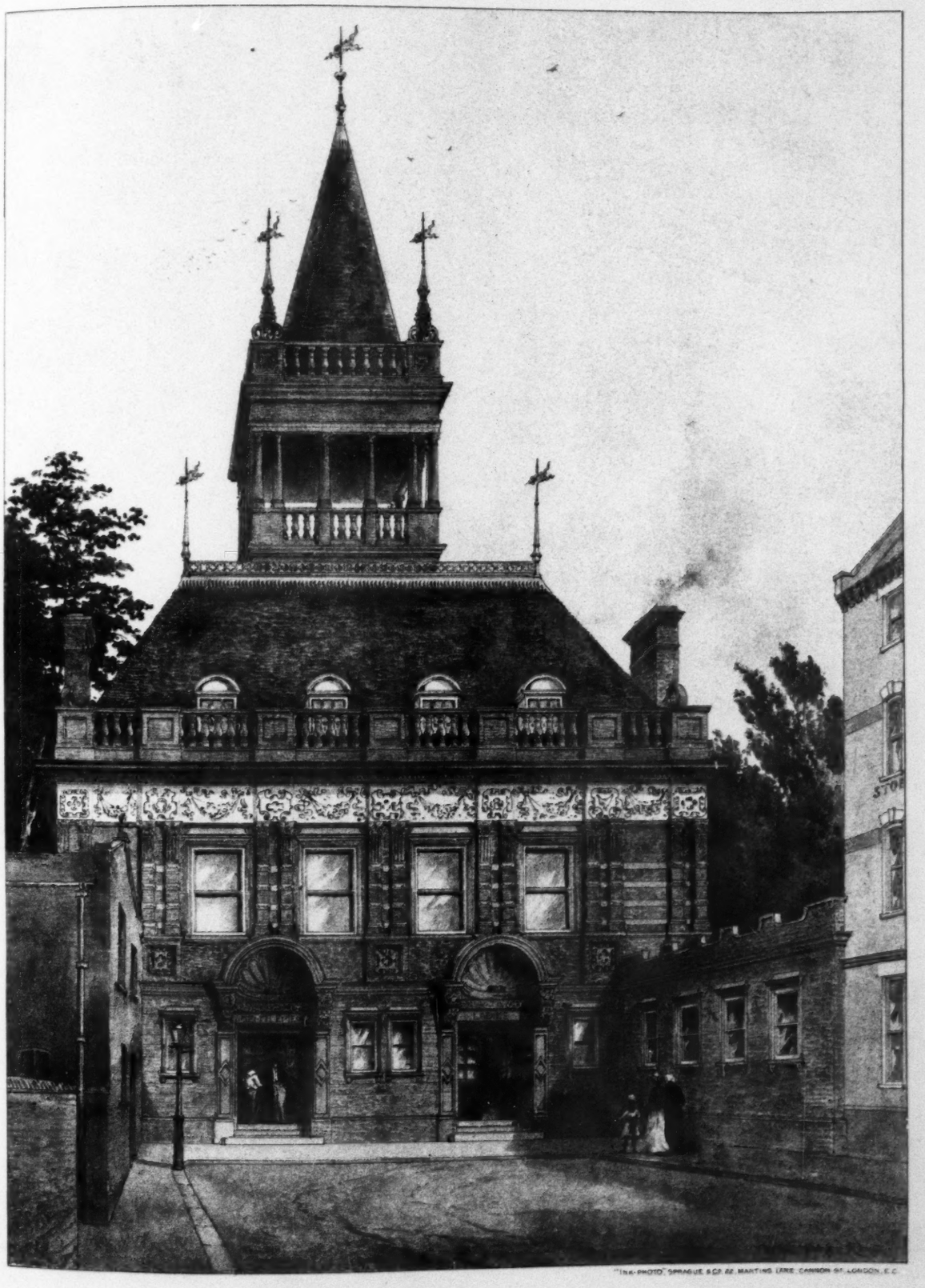
Anno dñi millimo ccc xxxvij°
Hic iacet Johannes de Cobham dñs de Kynderton
miles qui obiit in festo sancti Thome apostoli

LORD WILLIAM DE BRYENE, 1395.
SEAL, KENT

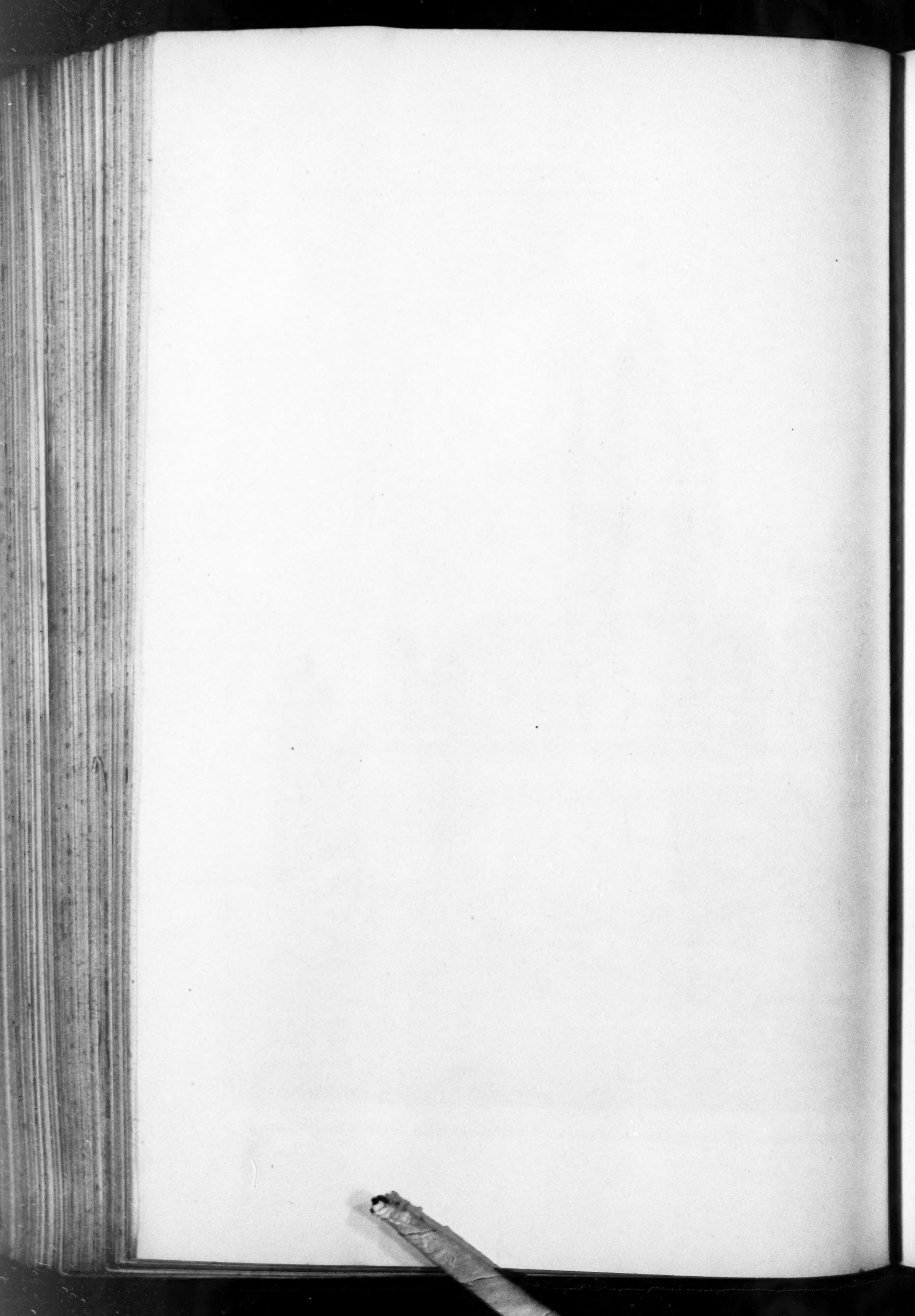
SIR RIGINALD DE COBHAM, 1403.
LINGFIELD, SURREY.

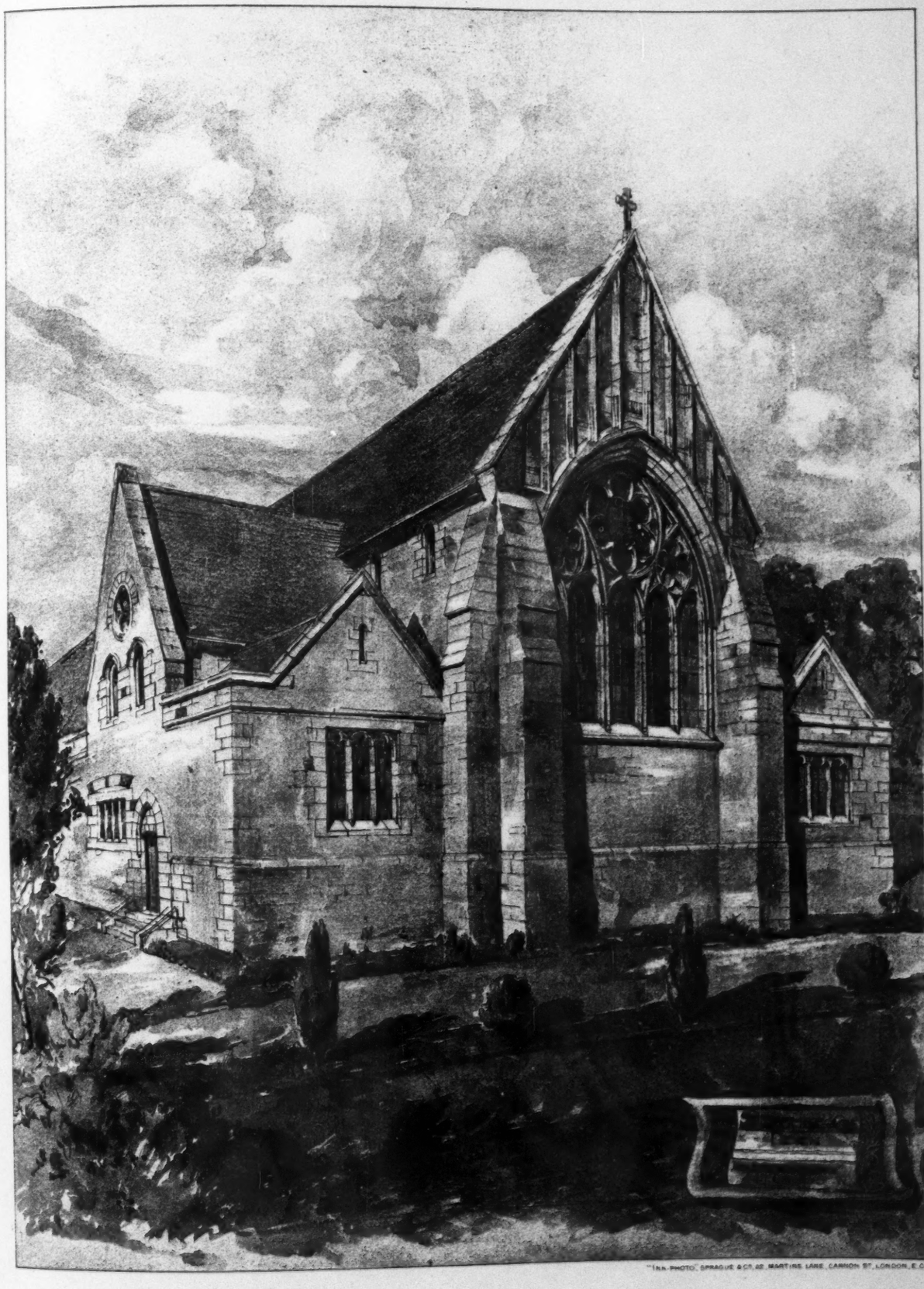
FROM RUBBINGS BY Mr. ANDREW OLIVER, A.R.I.B.A.





SELECTED DESIGN FOR CAMBERWELL GREEN BATHS: EXTERIOR.—MESSRS. SPALDING & CROSS, ARCHITECTS.





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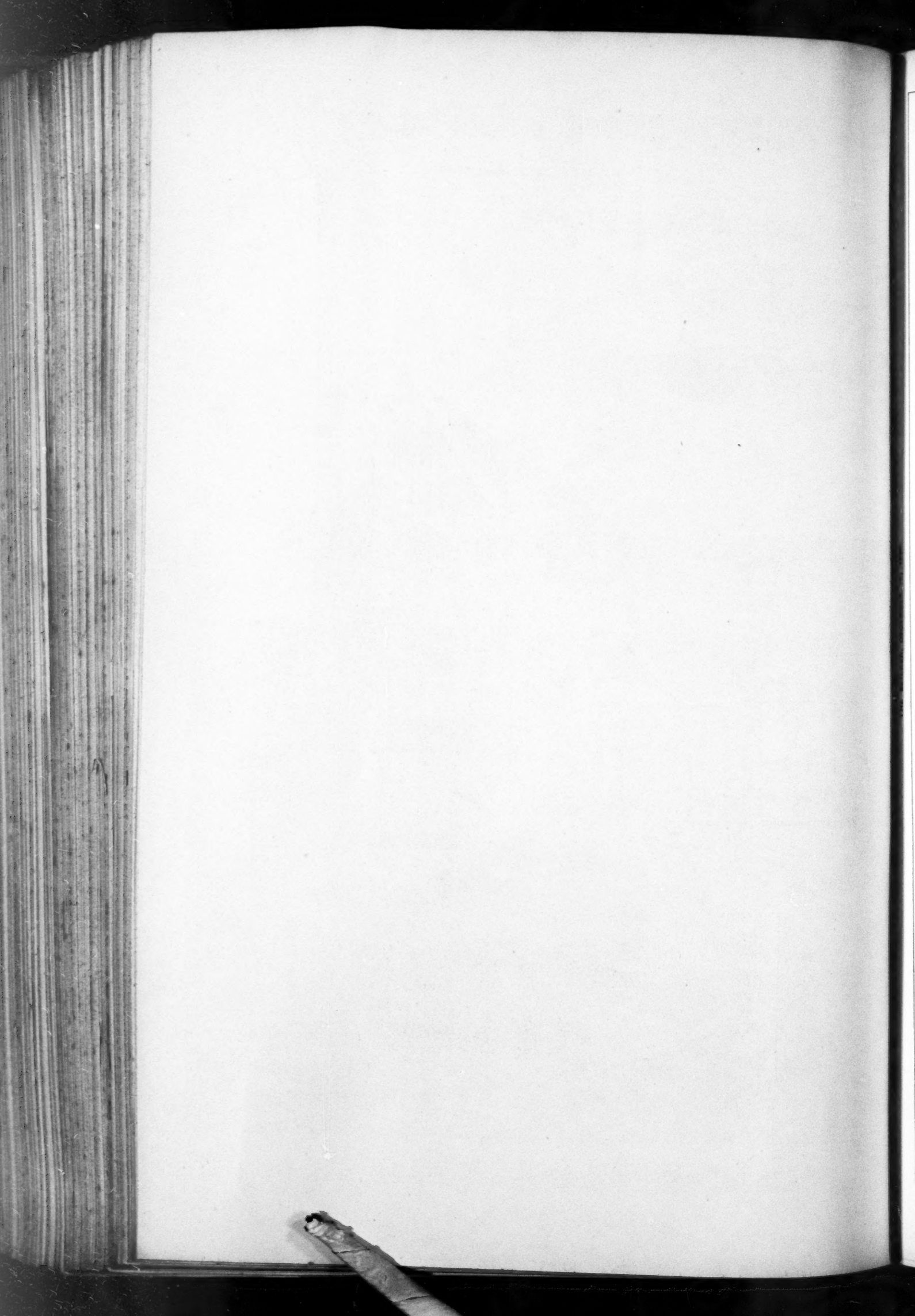


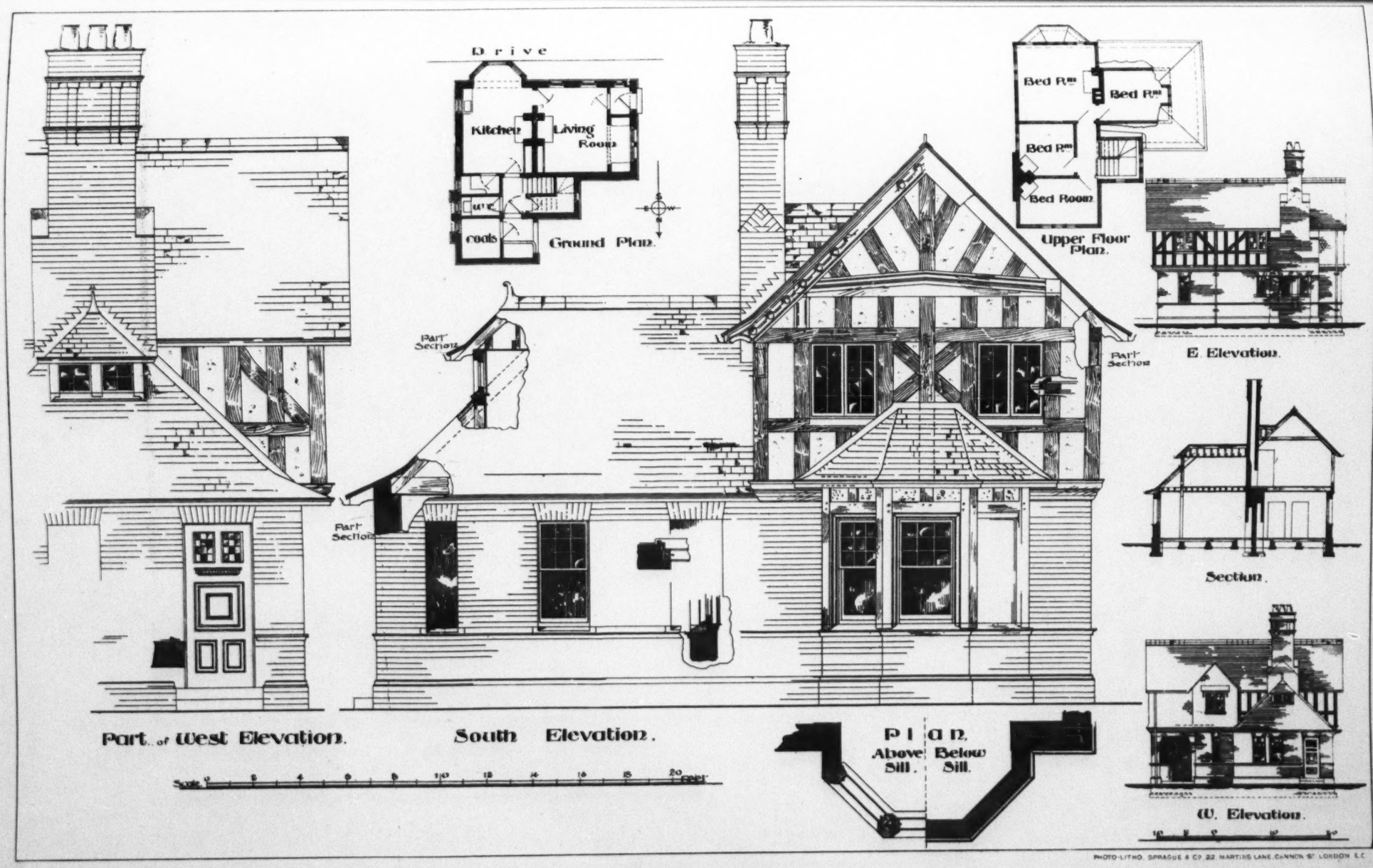


PHOTO-LITHO. SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON E.C.

ENTRANCE LODGE AT OTFORD.—Messrs. Roger Smith & Gale, Architects.

NEW READING-ROOM, WANDSWORTH FREE LIBRARY.

THE Wandsworth Free Library was the first established in the Metropolitan district under the Free Libraries Act. The Commissioners acquired an old house, of which the grounds had been detached, for building purposes, and adapted it to receive the library. Though void of the conveniences of a new building, the success which attended it in the adapted premises was increased by the gift from Dr. G.D. Longstaff of the reading-room, which overcame the chief difficulty in the original building, —namely, the want of space for a large number of readers.

The plan shows the walls of the original building scored, and the new uses of the rooms and the plans of the new reading-room are indicated. The walls externally were faced with white Suffolk bricks, and internally with Keen's cement, with decorative features in fibrous plaster by Messrs. Jackson & Sons. The building was carried out by the late Mr. Parsons, of Wandsworth. The architects are Messrs. Roger Smith & Gale.

LODGE AT OTFORD, KENT.

THIS is one of a series of buildings carried out by Messrs. Roger Smith & Gale for Mr. Barclay Field. The house and stables have been previously illustrated. The materials were red local bricks, Broseley tiles, and yellow deal framing, finished with pure Stockholm tar. The cost was between 800*l.* and 900*l.* The work was in this, as in the case of the rest of the work, carried out by Messrs. A. Bush & Son, of Gower-street, London, the clerk of works being Mr. James Redden.

THE LONDON COUNTY COUNCIL.

THE ordinary weekly meeting of this Council was held on Tuesday afternoon, Sir John Lubbock in the chair.

The Bethnal Green Slum-Clearance Scheme.—With reference to the report of the Housing of the Working Classes Committee, presented at the last meeting, and printed by us on p. 445, *ante*, Lord Compton, the Chairman of the Committee, now asked leave to withdraw the report. He said that at a special meeting of the Committee on Saturday last, it was decided at the commencement of their proceedings to proceed with their recommendation, as they felt that they could easily answer most of the arguments that were adduced against it at last week's meeting of the Council. Particularly as to the statement that the price of the land in question was equivalent to something like 5d. per room, he had to say that it only worked out something like 2¼d. At the end of the sitting they were informed that the other offer for this site would result in an acceptance, and in the area being partly covered by artisans' dwellings. When he brought forward the Boundary-street scheme he stated that the Committee were in hopes that they would be able without expense to re-house some of those who would be displaced. They expected at that time that one of the Gossett-street sites would be covered with artisans' dwellings; bnt subsequently they were told that it was to be sold for commercial purposes, and it was on that account, in fact that was the principal reason, why they brought forward their recommendation last week. As soon as they were informed that it was the intention of the gentleman who offered the site to erect cottage dwellings for the working classes to re-house about 200, they felt that the chief argument in suport of their proposals had been removed, and, therefore, he asked leave to withdraw it. It was the intention of the Committee, after the recess, to bring forward a full report as to re-housing in connexion with this scheme.

The recommendation was then by leave withdrawn.

Sky-Signs.—The Parliamentary Committee reported that they had decided to introduce a separate Bill to prohibit or regulate sky-signs, and not to attempt to deal with the subject as part of the General Powers Bill, and recommended the Council to affix the seal of the Council to the petition for leave to bring in the Bill.

Mr. F. Harrison, Chairman of the Parliamentary Committee, said they thought it undesirable that they should promote a Bill in which they claimed more than the public would give them. There were two points in which their definition might be more carefully guarded. One was that they ought to set forth a *minimum* of dimensions within which nothing should be considered a sky-sign, and the second was that nothing should be considered as a sky-sign unless some part of it stood higher than any actual building over which it was built. He begged leave to move:—

"That the Bill be referred to the Committee, with an instruction that the definition should be amended by adding the following provisions:—(1) To define a *minimum* measurement under which nothing shall be regarded as a sky-sign; (2) That nothing shall be considered a sky-sign of which no part stands above any part of the building on which it is placed."

Mr. Beachcroft, in seconding the amendment, said he regarded the measure as an attempt at grandmotherly legislation, only calculated to put fees into the pockets of District Surveyors.

Mr. Beck said that sky-signs were preferable to the horrible chimney-pots, and that he had seen some sky-signs which really improved the appearance of London rather than detracted from it.

Mr. Hollington said the desire of the Council was to avoid paying compensation for the removal of sky-signs Surely the Council would not be so unfair as to say a man should pull down his sky-sign previous to its having had a reasonable life, and he did not think that six years would be a reasonable life.

Dr. Longstaffe remarked that people had been allowed to disfigure London by all sorts of abominations, and he hoped that the Council would decide, although it might seem a bit grandmotherly, that people should not only not be allowed to do that which was a nuisance and injurious to health, but should not be permitted to do that which was a nuisance to the senses of their neighbours. But for the lack of some controlling power in these matters in the past, London might have been preserved from many disfigurements.

Earl Compton said that whatever might be said against ugly and in all probability dangerous sky-signs, he hoped that flags as a means of advertisement would not be interdicted.

Mr. C. Harrison, in reply, stated that there was not the slightest objection to the Council amending the Bill. It was very easy to refer back a clause to the Parliamentary Committee to define a sky-sign, but they had had eight or ten meetings, and with the advice of the Parliamentary agent and the Solicitor and all the members of the Committee, before they came to their decision, and if the Council could define sky-signs better he was sure the Parliamentary Committee would be very glad to accept any suggestion. There were special stipulations which prevented the Bill from affecting auctioneers' advertisements of houses to let, and brewers' signs. Under the Bill provision was made for an inspection or survey of sky-signs, and the District Surveyor should grant or refuse a certificate as to the stability of the sign, and its stays and construction generally. The Council would grant a licence for a continuance of the sign on the certificate being sent to them, and the licence would remain in force two years. It might be renewed for two periods of two years each, making six years in all. The sky sign should at the end of six years be in every case removed regardless of its structural condition, and, failing its removal, summary proceedings against the owner should be taken by the Council. If the sign were wanting in stability, and were not repaired or strengthened, proceedings should be taken by the Council to demolish it. By section 4, after the passing of the Act, it would be unlawful to erect or place any sky-sign wholly, or in part above, or over any house, building, structure, street, or way.

After some further discussion, the amendment was negatived, and the recommendation of the Committee agreed to.

The Proposed New Sludge Ship.—The Main Drainage Committee reported recommending that the proposal to obtain an additional sludge ship, as agreed to at their meeting on October 7 last be abandoned for the present. This was agreed to.

London Water Supply.—The Special Committee on Water Supply and Markets reported that they had passed the following resolution, which they submitted and recommended the Council to adopt:—

"That in the opinion of the Council it is necessary to inquire whether the present sources of supply of water are adequate to the growing demands of the population in quantity and quality, and that her Majesty's Government be requested to institute an immediate inquiry whether any and what steps should be taken to provide a new and better supply, so that a report may be made thereon in the course of the ensuing session."

The Chairman said that as he had proposed the resolution which was now recommended to the Council by the Committee, he was anxious to say a few words in its support. He had paid much attention to the subject of water supply, having served both on the Manchester and on the Liverpool Water Bills Committees of the House of Commons. He need not, however, enlarge on the reasons for doubting whether the supply of water in the Thames basin would be sufficient in quantity and satisfactory in quality for the supply of the rapidly-growing population in the metropolitan area. The memorandum of the vice-chairman, which they had all received, and the report of Mr. Binnie clearly set out the facts, as to which the Water Committee were indeed almost unanimous. The question was as to the policy. The Council, no doubt, had power under the Bill of last year to make inquiries, and indeed were doing so, but the sum to which they were restricted was not sufficient for more than a preliminary inquiry. Moreover, in this matter it was necessary not merely to convince the Council, but also the Government, and the Government would naturally attach more weight to an inquiry which they had themselves set on foot. The last words in the resolution were not in his proposal. They sounded rather peremptory, but were not meant to be so. It was certainly, however, exceedingly desirable that the inquiry should be completed as soon as possible. This recommendation had no reference to the purchase of the water companies. It would be equally desirable whether the supply of water was in the hands of the companies or of the Council. Far from conflicting with the policy adopted by the Council, it would be quite in harmony with it, because the adoption of the resolution would certainly render the companies more disposed to treat, nor would it conflict with the Bills proposed by the Vestries and the Corporation, because if the Government approved they might carry out the inquiry recommended in the resolution by means of the committee on one or other of those Bills. The resolution did not commit the Council absolutely to the statement that an additional supply would soon be necessary It did, however, record the opinion that the subject demanded the earnest attention of Government. If the Council rejected the resolution, and if the supply in a few years proved insufficient, he feared that they would be censured for having in this respect neglected the interests of London. If, however, they passed the resolution, they should have done all that for the present they were empowered to do. They would have recorded their opinion, and the responsibility would then rest with Government. It was from this point of view that he had proposed the resolution; it gave them the opportunity of expressing their opinion, which had not yet been done, and under these circumstances he hoped the Council would support the recommendations of the Committee, and call the attention of Government to the importance of the inquiry whether in a few years the water supply within the Thames area would not be insufficient for the growing population of the Metropolis.

Mr. C. Harrison, Chairman of the Parliamentary Committee, was sorry he could not agree with the recommendation of the Water Committee. He thought the proper way of dealing with this matter was that the Home Office should be asked in Parliament to undertake to ascertain the opinions of experts as to whether the present supply was adequate, and, if not, where a new supply was to come from. If a Government Department undertook that, they would instruct experts to do it properly and would pay the expenses, and they would have a proper report. He did not think the question would be at all carried further by a Royal Commission or a reference to a Parliamentary Committee and a number of engineers saying they thought this might be done, and that such a supply might come from the Chiltern Hills or some other place, without the actual physical investigation.

The Vice-chairman (Sir Thomas Farrer) stated that the Committee did not think it right in framing this resolution to dictate to the Government the actual form the inquiry should take. There were not only engineering questions, but semi-political questions,—questions

of the rights of other bodies, and questions of other consumers of water. No doubt the engineering question was a primary and difficult one, and it would be open to the Government, if they were pleased to accede to their views on the subject, to appoint a special commission of experts. They thought it far the wisest thing in this large concern, in which he might say they felt the Government must be interested and must take part, most respectfully, of course, to ask the Government to make an inquiry, leaving them to judge of the best way in which the inquiry should be conducted.

The recommendation of the committee was ultimately agreed to, and after transacting further business, the Council was counted out at five minutes before seven o'clock.

THE ASSOCIATION OF PUBLIC SANITARY INSPECTORS.

At the opening meeting of the new session of this Association, held at Carpenters' Hall, the new president of the Association, Dr. B. W. Richardson, delivered his inaugural address. There was a large attendance of members and visitors, among them being:—Dr. Danford Thomas, and a number of ladies. Mr. H. Alexander (Shoreditch), Chairman of the Council, opened the proceedings, and subsequently ceded the chair to Dr. Richardson. The address, which was extemporised throughout, commenced with an interesting historical contrast, in which the conditions of life in the eighteenth century were compared with the enormously improved conditions of the present period of the nineteenth, and concluded with the enumeration of the leading sanitary reformers of former times, and a sketch of the career of the last and greatest of them, the first President of the Association, the late Sir Edwin Chadwick. Medical opinion in the earlier of the two centuries was so little enlightened that even the profession often regarded the entrance of that dreadful malady—small-pox—into a family as a good thing because it was an inoculation, and therefore a safeguard against future attacks. The treatment of the insane, even in the case of persons wealthy enough to pay for proper treatment, was systematically cruel. Now the poorest inmates of asylums received better treatment than even kings or princes could then command, and the insane were frequently chained up in outhouses or cellars, like wild or savage animals. The death-rate, or rather the life-rate, the expression that he now preferred, might properly be called the pulse of the people. In a review he had set down the normal death-rate for England at 12·5 per 1,000 and the maximum at 15 per 1,000, but that very morning, as if providentially, he had received information from Hove (Brighton) of a rate reduced to 10·4. Even in the army, including that of India and other distant possessions, the rate, which last century was as high as 58 per 1,000, had now been reduced to 16 per 1,000. Such a death-rate as prevailed at the beginning of this century, even in towns considered fairly healthy, would create a panic if prevalent in any town now, and any such town would now be shunned as a plague spot. His picture of Hygeiopolis had been considered so overdrawn and impossible that it had been called a mere poem, but sanitary improvements were progressing at a rate which promised to make his elevated gardens of London realities before the end of the present century. Before treating of the "Sanitary Reformer" who was the principal subject of his address, Dr. Richardson enumerated the leading sanitarians of previous periods, commencing with that enclyclopedic philosopher, Sir Francis Bacon, the great Lord Verulam. In Italy Dr. Ramazzini, and in England Dr. Arbuthnot were the greatest reformers, followed in Scotland by a remarkable man, Dr. Benjamin Bell, who, with other merits, must be credited with being the first to propound the principle of Free Trade. Dr. Priestley, by his demonstrations of the properties of fixed air, and Dr. Pringle by his great army reforms, had subsequently carried on the knowledge of sanitary science in the last century, but it was to the new century that the greatest perhaps of all the sanitary reformers belonged, Sir Edwin Chadwick, their late venerated President. Dr. Richardson narrated the circumstances under which he had in 1852 first met Mr. Chadwick, then a barrister, whose interference in questions of health earned for him a certain amount of dislike in the medical profession. He declared that, although so unlike in many respects, their late President and himself had always been in agreement on leading principles, and that throughout a long and close intimacy they had never had a personal disagreement. Among the long list of reforms on which the influence of Mr. Chadwick had been the most powerfully felt, were those of workhouses, registration, graveyards, and the dwellings of the working classes,—but he had been the first to suggest a great number of the most beneficent movements of the present and the immediate future, including coffee palaces, public promenades, baths and wash-houses, model lodging-houses, and cremation, and, although he was not a teetotaller, he had conceived a broad-minded scheme for a Permissive Bill. Sir E. Chadwick's proposals for "workhouse reform" had been greatly misunderstood, and the misrepresentations made had brought him into undeserved obloquy. The term "Union" was invented by him for a purpose totally different from that to which it had been since applied. His scheme of "Union Workhouses" was a splendid conception, and had it been realised in its entirety it would have given us fifty years ago, under one and the same state organisation, not only the "workhouse," but the "almshouse and the industrial school," and a group of such institutions as have since been created by voluntary effort. Mr. Chadwick had originated the regular registration of births, deaths, and marriages, and had discovered that greatest of Registrars-General, William Farr. His "Report on the Condition of the Working Classes" was a monumental work, which he brought out at his own risk. The revolution in the rites of burial which had taken place in the latter half of this century was initiated by his work on graveyards and cemeteries. He was an earnest advocate of the doctrine contained in Ward's formula, "the sewage to the soil, land to land, and water to water." Even his last notion, that pure air should be brought through the clouds by long tubes, was worthy of the most vigorous of youthful minds; instead of being, as it actually was, the conception of a man of eighty-seven. To sum up, Mr. Chadwick held that the one word "cleanliness," if properly understood, included all that was meant by such scientific terms as "antiseptics" and others of recent invention.

The address was frequently interrupted by applause, and at its conclusion a vote of thanks was accorded to the new president on the motion of Mr. Richards (Battersea), seconded by Mr. Fairchild (Clapham).

At the second meeting of the Association, held on Saturday last, an address on "Cremation as a mode of disposing of our dead" was delivered before the members of this Association, with Mr. H. Alexander in the chair, at Carpenters' Hall, London Wall, by Mr. J. C. S. Hanham, the Hon. Sec. of the Cremation Society of England. The usual arguments against the customary modes of burial were cogently presented by the lecturer, an interesting experiment made by M. Pasteur being cited, among other proofs offered, in support of the declarations of Dr. Parkes and other sanitarians of the highest authority, that the vicinity of a grave-yard was always an unhealthy district to live in. The great French scientist proved the existence of morbid germs in earth, beneath which a cow had been buried, by an inoculation experiment, every one of a number of guinea-pigs inoculated with earth taken from above the buried cow dying after inoculation, while of an equal number similarly inoculated with ordinary earth not one failed to recover. The best and most economical way of destroying such germs was by fire,—a test which they were unable to survive.

A discussion followed, in which Mr. Alexander, Mr. Woonton, Mr. Richards, Mr. Middleweek, Mr. Tidman, and other members took part, in the course of which objections on the score of cost in time and money were urged against cremation. A vote of thanks was accorded, in replying to which the lecturer answered the principal objections offered. The cost of cremating a body was at present as much as 6*l*., but that was because the cost incurred was almost as much upon the fifty bodies per annum now disposed of in that way as it would be on three thousand. On the latter number the cost would not exceed half a guinea per body. There would also be a great public saving in the cost of sites for cemeteries if cremation became customary.

THE PLUMBERS' COMPANY.

On Monday evening last the Master, Wardens, and Court of the Worshipful Company of Plumbers entertained a large company at dinner, the guests including a large number of gentlemen who have interested themselves in the promotion of the movement initiated by the Company some years ago for the education and registration of plumbers.

The Master (Mr. W. H. Bishop) submitted the toast of "Modern Sanitary Science and Technical Education," and in speaking of the efforts put forth by the Plumbers' Company, said the scheme involved a training for apprentices in the technical schools and colleges, some of the Principals of which he was very pleased to see present that night. A scheme had been prepared, and a syllabus of instruction issued to men who had passed through apprenticeship in order that the principles of science and the practice of plumbing might be improved. He coupled with the toast the names of Sir Bernhard Samuelson, M.P., Dr. Robert Farquharson, M.P., and Professor Garnett.

In replying, Sir Bernhard Samuelson congratulated the Plumbers' Company upon the great advance they had made with regard to the question of technical education.

Dr. Farquharson expressed a hope that in the future sanitation would permit of a man living 100 years to enjoy the good health which modern sanitation offered to every man.

Professor Garnett, responding, said the nation was indebted to the ancient guilds of London for what had been done in the promotion of technical education, and to none more than to the Plumbers' Company.

The Master then gave the toast of "The Municipal Corporations of Great Britain and Ireland," and, in doing so, he said what the Plumbers' Company had promoted was a union of masters and operatives, and he was not aware that this had been so successfully effected in any other large trade. This was a volunteer system of registration, based upon the best of qualifications, which, he thought, was the only one in which the co-operation of all authorities could be secured throughout the country. The movement had been generally responded to, because the health of the community depended upon the result. The President of the Local Government Board was one of the first to recognise the importance of the movement, and a circular was issued by the Plumbers' Company at his express suggestion, and this circular met with the ready support of all the County Councils. During the year they had held 123 meetings, and he believed that he might say that 200,000*l*. would be spent in economic and sanitary science, subject to the approval of the Attorney-General, and they had some hope that this would be supplemented by other contributions, and that it would be ultimately available for the promotion of an educational scheme which would be given to the whole of Great Britain and Ireland. He associated with the toast the names of the Mayor of Manchester and Mr. Ex-Bailie Crawford.

The Mayor of Manchester and Mr. Ex-Bailie Crawford having acknowledged the compliment,

The Lord Mayor proposed "The Health of the Master of the Plumbers' Company." He said it would be impossible for a livery company to take up such a great work without its possessing a good Master at the helm; and he was sure the Plumbers did possess a very excellent Master. He hoped there might be held in the City of London a congress on hygiene, and he could assure them, if it was held, it would have his heartiest support, and he was certain he would receive the greatest assistance from the livery companies of the City.

The Master briefly thanked the company, and gave the toast of "The Guests," to which Sir E. Sieveking and Mr. G. Galloway responded.

Proposed Improvements in the Isle of Man.—At a sitting of the Tynwald Court in Douglas, on the 25th ult., the petition of the Douglas Town Commissioners for leave to borrow 4,000*l*. for the erection of a public abattoir was presented and referred to a committee to report on the question of a site. The report of the committee of the court respecting the swing-bridge over Ramsay Harbour and further improvements on the Mooragh estate was presented. The Town Commissioners of Ramsay ask for a further loan of 12,000*l*. The committee reported generally that it appeared essential that the works should be carried out, and that the borrowing powers to the extent of 14,000*l*., instead of 12,000*l*., be granted, making the total indebtedness nearly 56,000*l*.

Bygone Nottingham.—Mr. T. C. Hine, the well-known Nottingham architect, sends us a copy of a lithograph sheet from his drawing (made we presume for private circulation), in which he has brought in a kind of general view a number of bits of old Nottingham which have now disappeared: the old guild hall, the market cross, the old bridge over the Trent, &c.; the whole including twenty-eight relics, mostly architectural. They are compiled from former sketches by the author, and from illustrations by Speed, Deering, Sandby, and others. The names of Nottingham worthies are worked into scrolls on the ornamental border.

Correspondence.

To the Editor of THE BUILDER.

MR. WATERHOUSE AND THE ARCHITECTURAL ASSOCIATION.

SIR,—I have seen, with some surprise, that Mr. Waterhouse's statement that the new education scheme in its entirety was not adopted by the general body of members, has met with some challenge.

The proposals were put before a meeting not by any means full, and were not all adopted unanimously, while subsequent meetings proved that there was a growth of feeling on the subject, which rendered it impossible to carry out the scheme without modification.

The Committee that has just been sitting was not appointed for the purpose of giving effect to the scheme, but to act more as a conciliatory body to further consider the proposals, especially as there had been such a strong expression of opinion on the advisability of affording means to consult the general body of members in any changes of a drastic nature.

I take it that Mr. Waterhouse's view will be accepted as more correct than those of the partisans of the "curriculum." A. NEEDHAM WILSON.

BARFRESTON CHURCH, KENT.

SIR,—In the *Builder* of the 5th, you state "There is a curious semi-Celtic appearance about some of the ornaments which seems to indicate some special influence at work in the erection of this church, which has this other notable feature, the curious irregularity in the setting out," &c., &c.

This latter peculiarity is very characteristic of Roman work.

Was the original production Romano-British? With regard to the string mouldings, the fret, and the patera ornamentation, they, too, are of that school.

Of the latter ornament, I remember seeing something very similar at the Roman villa at Torkington, Gloucestershire; and I enclose a tracing of a rubbing from a small piece of string moulding in Purbeck marble, found in the excavation of the Basilica at Silchester some years ago.

Bath, December 8, 1890. RICHARD MANN.

BRIDGE CHAPELS.

SIR,—With reference to this interesting subject, lately discussed in your columns with illustrations from these mediæval structures, I would wish to refer those students in this branch of archæology to the "Calendar of Wills," proved in the Court of Hustings, London, recently edited by Dr. Sharpe, of the Town Clerk's office, and published by the corporation of the city.

In Part II. of this volume are numerous particulars of the wills of London citizens, and many items on the benefactions given for the maintenance of St. Thomas's Chapel on London Bridge, especially as to the keeping up the chantry in the same building.

These entries range in date from 1358-1688, so that a wide area is introduced, and the variety of bequests made with frequent mention of old (and now destroyed churches), affords many a clue to the searcher for the past architectural wealth of old London.

Though naturally the documents are drawn from civic sources, still frequent mention is made of repairs and preservation of ancient bridges elsewhere, and where existing, of the chantry chapels founded on or near them. Surely the annalistic side of architecture is much enriched by such publications as the above. S. W. KERSHAW, F.S.A.

BRICK-BURNING.

SIR,—I assumed that my letter on this subject would only be of interest to brickmakers, and did not go into details, and, with your permission, I would like to reply as briefly as possible to the very fair and moderate letter signed "A Brickmaker."

Clamp bricks are burned with breeze and ashes; the first is used in layers in the clamp, the latter being introduced into the body of the brick itself, by being spread over the brick earth that has been dug and curfed up, or washed into a back, as the case may be; when used the temperer cuts down the face, and it is mixed in the pug-mill.

The breeze and ashes are procured as follows:—Dust-bin refuse is collected, bulky items are picked out, and it is then screened,—the coarse is the breeze, the fine is ashes,—it goes through no other process, and it is perfectly obvious that the filth will go through the screen as easily as the ashes. It is this filth that, when burnt, causes the stench.

I say that the clamp brick is doomed if the new by-law is enforced, because the present system of burning cannot be continued without causing a nuisance; if the by-law is not to be enforced, why unduly harass a trade; competition is severe,—I notice bricks made in Belgium being used in London, for both house building and street works. A properly-burnt brick, whether clamp or kiln, is imperishable; underburnt bricks, on either system, will not stand, and should only be used for interior work (if at all).

The bad kiln bricks referred to are probably such, or may be semi-dry bricks,—these, unless made from suitable clay, will not stand at all.

I consider that both clamp and kiln bricks are burnt, the former partly by heat from the layers of breeze, but principally by the fuel in the brick; and the latter by the application of heat from coal fires applied to the outer sides only. Kilns when burning give off the gases and products of combustion from the coals, and very little of that if in competent hands. There is nothing injurious in this, or in the bricks themselves. It is the filth, that cannot be separated from the breeze and ashes, that causes the trouble.

I know full well what is embarked in, and dependent upon, the trade. Many of my friends say that they have not heard of the proposed by-law, and it seems to me altogether wrong that a law having such serious and far-reaching effects, should be passed (as far as I can learn) without any proper inquiry into the rights and wrongs of the matter.

However, one thing is certain, you may doom a system, you cannot stop the trade. London has been, is, and will be a city of brick; and bricks and brickmakers will be wanted in ever-increasing numbers. It is simply a question of burning on a different system, for the sake of the public health. With the remarks as to compensation, and the last paragraph of your correspondent's letter, I heartily agree. JOS. JOPLING.

"DEATH TO IMPERFECT VENTILATORS."

SIR,—Mr. Buchan's letter in your last doubtless refers to me, although my name is misspelt,—probably through indistinct handwriting,—which thus exhibits a parallel with Mr. Buchan's arguments.

I have no time for long letters, not yet having arrived at the stage of "cultured leisure." So I must simply say:—

1. I have never, under any circumstances or at any time, advocated the use of valves in such a manner as to produce syphonage. In fact, I have never once mentioned soil-pipe ventilation in connexion with any valve. I do so now.

2. Exit valves may be used to distinct advantage on soil-pipes, and without causing syphonage.

3. This "distinct advantage" necessitates a radical deviation from the lines laid down by Mr. Buchan.

The above are direct contradictions of Mr. Buchan's statements. I may go further, and say he never invented a closely-fitting exit-valve such as mine, and I call upon him to indicate where one such is patented, or where one such of his manufacture is in use.

The kind wish expressed by him that my ventilator should be withdrawn from the market is so disinterested and unusual, as coming from a rival ventilator maker, that I hasten to thank him, and "refer his kind recommendation to the proper quarter." J. F. SIMMANCE.

Liverpool, December 4, 1890.

THE COMMUNION TABLE.

SIR,—The recent judgment of the Archbishop of Canterbury will have drawn the attention of those who have read it to the fact that there was a period when the altar was replaced by a table standing east and west within the chancel, and sometimes within the nave, of our parish churches. Some years ago an oak table in a very decayed condition came into my possession, and I was informed that at one period it had stood in a church in Westmoreland. It is of good design, and may be seventeenth century, or even sixteenth century, work, but had the peculiarity that its legs are of two different patterns, and that they were placed in pairs at the two ends. That is to say, the legs at one end were handsomer than those at the other end. This unusual peculiarity can be understood if the table was to stand so that the congregation would habitually see its end, not its side, and is, I think, sufficiently curious to justify me in asking you to find room for this brief notice of it. Was it customary?—T. R. S.

FUNGUS.

SIR,—Can any of your numerous readers inform me how to destroy "fungus" (in an old brick wall), the growth of which has completely rotted a set of door jambs which have only been fixed a little over a twelvemonth? I had the jambs well painted before they were fixed, and the brickwork well "dressed" with hot lime.

AN OLD SUBSCRIBER.

GRADIENT INDICATOR.—We have received an illustration and description of "Brown's Automatic Self-adjusting Gradient Indicator," the principle of which consists in a curved spirit tube in which the bubble remains stationary at a point in the index marking the angle of the surface on which it is resting. We have not, however, had any opportunity of testing the instrument.

The Student's Column.

HOT-WATER SUPPLY FOR BATHS, LAVATORIES, &c.—XXIV.

SAFETY VALVES, &c.

THERE are at present but four kinds of of safety valves made for range boilers, viz., spring, dead-weight, lever, and diaphragm.

The spring valve, shown in section at fig. 62, is, perhaps, the one mostly used owing chiefly to its occupying but little room; it consists of an outer case A, a screw cap B, pin C, seating D, and a spiral spring.

The seating is held in place by the spiral spring which presses upon it at one end and at the other end against the screw cap; this is where the utility of the screw portion of the cap manifests itself, as by unscrewing the cap we slacken the pressure exerted by the spring, and by screwing the cap down the spring exerts a greater force. The seating has the under side of it covered with a special compound of a rubber character so as to easily effect a watertight joint, and the outer casing is perforated to allow of the ultimate escape of the steam when the seating is lifted.

When fixing these valves, and the apparatus is charged, it is usual to unscrew the screw cap until the valve leaks, then screw it up again until the leakage ceases, and afterwards give it one extra turn to keep it quite sound under ordinary conditions.

Undoubtedly, the proper place for a safety-valve is in the boiler, but it is very desirable to have the valve in sight, and this precludes the idea of having it fixed directly into the boiler itself; therefore, the next best arrangement is to have it fixed somewhere in sight, and connected directly with the boiler by a fair-sized pipe; there is no great risk of this pipe becoming stopped, not even by fur, as the water does not circulate within it, and if it is taken from the *top* surface of the boiler, there is not a great likelihood of the opening to the pipe being "furred" up, unless the boiler is allowed to get into a very bad state indeed.

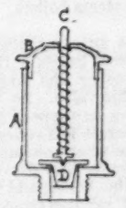


FIG. 62.

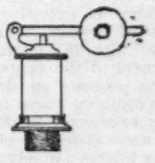


FIG. 64.

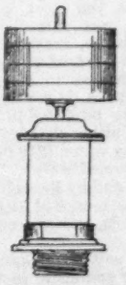


FIG. 63.

FIG. 65.

There is an idea rather prevalent that as good a place as any for the safety-valve is on the cylinder (of the cylinder system). No doubt the advocates of this method have strong arguments in favour of it; but it must be borne in mind that cylinders *never* burst. It is the boiler that is the seat of danger, and where the pressure is exerted to the greatest extent; and, what is more, some of the accidents are due solely to something that occurs between the boiler and the cylinder — stop-cocks, for instance.

It was said just now that cylinders never burst—neither do they; they collapse, which is a very different thing, and which a safety-valve would in no way obviate, as the valves in question are provided expressly to relieve a pressure

that is exerted from the inside, whereas a cylinder collapses from an external cause—viz., atmospheric pressure, and an inlet-valve would be the proper thing to obviate this.

The collapse of cylinders is of as great a rarity as the bursting of boilers, and it is brought about usually in this way:—Supposing a cylinder for some reason is allowed to get empty, and a fire is still kept in the range (a most unlikely thing), if there is any water in the boiler this will boil, and the steam will, of course, enter the cylinder; now it is well-known that there is no better means of driving air out of any confined space than by injecting steam into it, and consequently while the steam is entering the cylinder in fair volume, very little air will remain there. While things are in this condition, if cold water is introduced the steam is condensed, and a vacuum is formed, when the pressure of the atmosphere crushes in the cylinder like cardboard. It takes but little calculation to arrive at the force exerted by the atmosphere, as we only have to find the number of square inches on the external surface of the container and multiply by 15 to have the total pressure in lbs. With a medium-sized cylinder this pressure would be about 15 tons.

The next form of safety-valve in general favour is the "dead-weight," as fig. 63. The body of the valve is similar in form to the one last described, but the seating is held down by weights placed and bearing upon the central pin. This is a good valve, but unfortunately takes up a good deal of room, and is not of sightly appearance, otherwise it is to be recommended on the score of reliability. This valve is still more unsuited to place directly into a range boiler, but it can be connected by means of a pipe, as described with the last. After it is fixed sufficient weights are placed on to just prevent leakage, then an extra weight is added to keep it quite sound under ordinary conditions.

Next in rotation comes the lever valve, as fig. 64, this is similar in internal construction to the two preceding, but the pin which bears upon the seating is held down by a weighted lever above, as shown; this is another reliable valve, but is even more cumbersome and unsightly than the dead-weight, consequently it is rarely seen affixed to range boilers, but it is a valve that must be familiar to every one, as it is much used on all sorts of steam boilers. It is a very safe valve.

The last to be described is an arrangement by which an excessive pressure bursts a thin sheet of copper, thus releasing the undue strain. Fig. 65 illustrates this valve. As the thickness of the copper must be proportional to the pressure on the boiler, it is necessary when ordering these to state what pressure of water exists, or, in other words, how far the cold-water cistern is above the boiler, and the maker inserts a diaphragm of suitable strength or lightness. Should the valve come into operation, it can easily be put in order again by the mere insertion of another diaphragm.

Fusible plugs are, perhaps, the most ingenious form of safety-valve ever introduced, but, owing to certain drawbacks, exceedingly difficult to overcome, they are not used as freely as they would otherwise deserve to be. A fusible plug, as its name implies, is a plug or piece of material arranged to be fitted in the boiler in such a manner that, although infusible at the temperature of boiling water (212 deg., or thereabouts), it would immediately melt if the boiler was without water, and by its melting leave an aperture for the free escape of steam, should water afterwards flow in, and so prevent an explosion and disaster.

These plugs are pieces of soft metal, usually a disc, enclosed in a brass or gun-metal socket, this socket being screwed *inside* the boiler (to prevent injury by the poker or stoking tools), and it is further made so that part of it is easily removable to replace the plug, when it may require renewing.

These plugs, however, can not only be used as an element of safety when danger from shortness of water arises, but, if properly made, will answer the purposes of a safty-valve when any dangerous symptoms arise with a full boiler, in the following way:—When a hot-water apparatus is working under normal conditions, with the expansion and cold supply pipes open, it may be assumed that the water does not ever reach a higher temperature than 212 deg., this being the boiling point at sea-level, where the pressure of the atmosphere is 15 lbs. to the square inch. If by any means the two pipes just mentioned become tightly closed, the atmospheric pressure will not regulate the boiling and consequent temperature, and before we have an explosion it is probable the pressure exerted in the apparatus will be 100 lbs. to the square inch, this pressure permitting the water to have a temperature of 330 deg. (approximate). This fact is utilised by making the fusible plug of an alloy (bismuth, &c.) that will melt at, say, 280 deg.—the superheated water will then effect its fusion and the approaching danger be obviated. This, however, as will be clearly understood, needs the plug to be most carefully made if it is to be relied upon.

The great objection to the fusible plug, in the South of England, is the "fur" deposit from hard waters. If the plug gets even a thin coating of this material it must suffer, as the deposit being a low conductor of heat, the water is prevented from absorbing the heat from the plug as fast as it receives it from the fire, and under these circumstances it will be found that the plug will more frequently fail when no danger is to be feared, than the reverse. With soft water there is no objection to be raised, but notwithstanding this, fusible plugs have never gained favour, and are most commonly used as auxiliaries to ordinary valves, or to meet some special condition that may exist.

SURVEYORSHIPS.

Perth.—At a meeting of the Perth Police Commission, held on the 8th inst., Mr. Robert M'Killop, of Messrs. Cunningham, Blyth, & Westland's, civil engineers, Edinburgh, was appointed Burgh Surveyor and Superintendent of Works and Drainage for the city, at a salary of 175*l*.

St. Helens.—At the last meeting of the St. Helens Town Council, it was decided to grant the Borough Engineer, Mr. Geo. J. C. Broom, Assoc.-M.I.C.E., the sum of 100*l*. for extra works carried out by him during the past year, principally the erection of the new public baths, just completed, at a cost of 10,086*l*.

GENERAL BUILDING NEWS.

The Perse School for Boys, Cambridge.—The new buildings for the Perse School for boys in Cambridge were opened on the 4th inst. by the Mayor, and a banquet was given in the great hall by the Chairman of the Governors, the Master of St. John's College. The school is a first-grade school, and at present has about 200 boys. The new buildings are calculated to accommodate between 300 and 400 with ease. The general plan of the school-buildings is that of a large hall with twelve class-rooms grouped on the north side of it. The hall is 77 ft. by 37 ft. 6 in., and 25 ft. to the wall-plate, and it has an open timber roof. The class-rooms are each 24 ft. by 20 ft.; those on the ground floor are 13 ft. high, and those on the first floor are 15 ft. high to the collar. Beside the above class-rooms there are head-master's and assistant-masters' rooms, a large entrance-hall and board-room, and all the necessary lavatories and out-buildings. The lodge is a small building at the gateway, calculated to accommodate a porter without family. The general style of the building is that of the end of the seventeenth century. It is built with red bricks, and the roof covered with red tiles. A lofty bell-cot rises from the centre of the hall roof. The entrance doorways and the gables are finished with red terra-cotta, and the windows have timber frame work, painted white. The architect is Mr. W. M. Fawcett, of Cambridge, and the builders were Messrs. Kerridge & Shaw, of the same town. The total cost has been about 7,200*l*.

The New Olympic Theatre was opened last week. Last year, Mr. Charles Wilmot bought the old building, demolished it, and has since erected the new theatre for Mr. Wilson Barrett, now lessee, on the designs of Messrs. Crewe & Sprague, of Fitzalan House, Arundel-street, Strand. The style of the decoration is Louis Seize, and it has been carried out by a Parisian firm. The tableau-curtain and the stalls, both in rich silk plush, the velvet seats in the dress-circle and upper boxes, and the upholstering generally, have all been done by Messrs. Oetzmann & Co., of Hampstead-road, and are of the tint known as "Rose du Barry." The house is lighted by both electricityand gas, the former installed by Mr. H. South.

New Premises, Walsall.—Some new buildings have just been completed at the junction of Lichfield-street and Bridge-street, Walsall. The buildings comprise five shops, and also rooms used by the Literary Institute. The chief shop is occupied by Mr. Draycott, in the basement of whose premises there is a packing-room, framing and gilding shops, store for residuals, heating apparatus, and fuel-store. On the ground-floor is a retail shop and frame-making shop. The first-floor comprises a reception-room, having a panelled ceiling picked out in colours, panelled and moulded dado, walnut chimneypiece, &c. On this floor there is also a private office. The second-floor is lighted by means of a stained-glass ceiling-light. On the left are dressing-rooms, and on the right a studio, at the back of which are enlarging, dark, re-touching, spotting, negative, and stock rooms, also lavatory, &c. On the third-floor are situated the printing, drying, sensitising, toning, stock, and artist's rooms. The building, which is in the Queen Anne style of architecture, is treated in red terra-cotta with a sea-green slated roof, surmounted with ornamental iron cresting. A separate staircase, for the use of the employés, has been provided. The contract has been carried out by Messrs. Bradney & Co., of Wolverhampton, from the designs and under the superintendence of Mr. F. E. F. Bailey, A.R.I.B.A., Walsall.

New Post-office, Dunfermline.—A new post-office, erected by the Government in Queen Anne-street, Dunfermline, was formally opened on Monday. It has been built from plans by Mr. W. Wybrow Robertson, of H.M. Office of Works, Edinburgh. An improved system of ventilation has been introduced by Messrs. Baird, Thompson, & Co., ventilating engineers, Glasgow, their "Grahtryx" exhaust ventilator being used for the extraction of the vitiated air.

New School for Hull.—The ceremony of laying the foundation-stones of a new Grammar School for Hull was performed on the 4th inst. The site is in Leicester-street, and the design for the new schools has been prepared by Messrs. Smith & Brodrick, architects, of Hull. The building will have an elevation of red brick and stone dressings.

Blackpool South Shore Pier and Pavilion.—The proposed new pier and pavilion for Blackpool South Shore will, it is anticipated, fulfil a long-felt want of the residents in and visitors to South Shore. The total length of the pier is about 340 yards, the pier promenade having a width of 45 ft. The pavilion structure, which will be capable of seating 1,850 persons, will be situated about 200 yards from the shore end of the pier, and is designed in the Byzantine style of architecture. The building will be rectangular in plan, and the roof will have a curved outline. Small ornamental cupolas emphasise the angles of the main building, larger cupolas surmounting the whole structure. Encircling the main building will be a low colonnade or verandah, and the band kiosk will be situated behind the pavilion at the end of the pier structure. The architect for the entire superstructure is Mr. J. D. Harker, A.R.I.B.A., of Manchester; Mr. T. P. Worthington, engineer, of Blackpool, being responsible for the substructure.

New Market at Halifax.—The Markets Committee of the Halifax Corporation are preparing a scheme for a new market on the present site, between Southgate and Market-street. Much property in that neighbourhood and Corn Market has been bought by the Corporation. The streets are being widened, and a new one—or rather an arcade—will be formed from Old Market to the Market. There are to be about 100 stalls in the covered area of the market and some fifty butchers' shops, and 40,000*l*. or 50,000*l*. is the estimated cost of the scheme.—*Leeds Mercury.*

Tetbury Church Restoration.—The restoration of the tower and spire of Tetbury Parish Church, Gloucestershire, is about to be undertaken by Mr. W. H. Yatman, of Highgrove. Messrs. Waller & Son, of Gloucester, are the architects.

Ludlow Parish Church.—The Lady Chapel of this church is now being restored under a scheme prepared by the Charity Commissioners for the management of a legacy of 2,000*l*. by Maria A. J. Nightingale. The stained-glass window is being renewed by Messrs. Hardman, of Birmingham, at an estimated cost of 630*l*. The stone tracery of the whole of the windows, together with the ashlar work of the exterior, is also being restored by Mr. Thompson, of Peterborough, at an estimated expense of 580*l*. During the work, an old priest's door has been discovered, and some carved Early English tracery and the old tile pavement of the fourteenth century have been exposed.

Rudbaxton Church, Pembrokeshire.—The Church of St. Michael, Rudbaxton, is to be restored by Mr. Reginald G. Pinder, F.R.I.B.A., of Bournemouth, the architect appointed by the restoration committee. It is one of the oldest churches in the county, and possesses many interesting features. It is stated to be at present in a very bad state of repair.

Opening of a New Church in the Garw Valley.—A mile to the north of Pontycymmer Station lies the little town of Blaengarw, and at this place a new church was consecrated on the 8th inst. by the Lord Bishop of Llandaff. The church is a stone building of cruciform plan, and in plain Early English style. The nave is 61 ft. by 28 ft., and the chancel 22 ft. by 19 ft. 6 in. There is also a vestry and an organ-chamber, spaces being left on the north side for extra accommodation,—the present being for 300. The ground woodwork is all of pitch-pine, and the roofing of stained red deal. The building is heated by hot air on Perritt's system. The contract price was 1,085*l*. The architects were Messrs. Bruton & Williams, Cardiff and Barry Dock; and the builder Mr. John Rees, Ynysybwl. The site was given by the Earl of Dunraven.

RE-OPENING OF TICKENHAM CHANCEL. — The chancel of the parish church of Tickenham, Somerset, has just been re-opened after complete internal renovation and restoration, under the supervision of Mr. Ewan Christian, the work being carried out by Mr. W. A. Green, contractor, of Clevedon. The plaster, which had been coloured with a blue wash, has been removed, and the plain stone laid bare. The floor has been raised to its former level, and paved with Godwin's encaustic tiles. New oak seats have been supplied, and the levels of the windows lowered and made even, the side windows being filled with tinted glass. In the course of restoration, interesting discoveries were made of a very large hagioscope, opening out into the north aisle and giving a full view of the altar, and a slab under the former wood pavement of the sanctuary, bearing an inscription. The approach to the rood-loft was opened out, disclosing six steps in good preservation, but closed up again, as it was feared the stability of the chancel arch—the only remaining portion of the original Norman church—would be interfered with.

NEW CLUB BUILDING, NEWCHURCH.—The Marquis of Salisbury opened, on the 3rd inst., a new Conservative Club-house at Newchurch, Lancashire. The building is designed in a Late Gothic style of architecture. It has been simply treated, the walls being faced with parpoints and having ashlar dressings. The assembly-room provides accommodation for over 400 people, and has a separate entrance for the public from the side street. Retiring rooms, ladies' room, lavatories, kitchen, &c., are arranged around the assembly-room. From the entrance-hall a staircase leads to the first floor, on which are situated the club-rooms, consisting of two billiard-rooms, reading room, and rooms for the committee, secretary, and steward, as well as a room for dominoes, chess, &c. The cost of the building is 2,000*l.*, and the work has been carried out from the designs and under the supervision of the architect, Mr. Percy D. Lodge, of Manchester.

NEW WESLEYAN CHAPEL AT GOOLE.—On the 4th inst. a new school-chapel, erected for the Wesleyan Methodist body off Booth Ferry-road, Goole, was opened for public worship. The cost of the building is 800*l.* Mr. H. B. Thorp, Goole, was the architect.

A NEW CONVENT AT BAYSWATER. — A new convent is in course of construction at Bayswater for the order of Notre Dame de Zion; Mr. Arthur Young is the architect. The floors are to be of fireproof construction, and are to be put in by Messrs. Mark Fawcett & Co.

SANITARY AND ENGINEERING NEWS.

THE SANITARY ASSURANCE ASSOCIATION.—At the meeting of the Council of the Sanitary Assurance Association, held at the offices, 5, Argyll-place, W., on the 8th inst., Sir Joseph Fayrer, K.C.S.I. F.R.S., in the chair, the question of consolidating and amending the Public Health Acts was under consideration, and on the motion of Mr. Mark H. Judge, A.R.I.B.A., seconded by Surgeon-General Cornish, C.I.E., the following resolution was unanimously agreed to:—

"That the Council of the Sanitary Assurance Association learns with satisfaction from the Queen's Speech, that the Government have in preparation a Bill consolidating and amending the laws relating to public health, and, therefore, it is hereby resolved to appoint a sub-Committee to draw up a memorial to the Government, urging them to incorporate in their Bill the essential features of the Sanitary Registration of Buildings Bill."

On the motion of Mr. H. Rutherford, Barrister-at-Law, seconded by Mr. Andrew Stirling, it was also resolved to send copies of the resolution to the Institutions which took part in the Sanitary Registration Conference of 1887 and 1888; also to Dr. R. Farquharson and the other Members of Parliament who had charge of the Sanitary Registration of Buildings Bill in Parliament.

NEW ROADWAY BRIDGE OVER THE RIVER CAM AT CAMBRIDGE.—Owing to the township of Chesterton, which lies immediately opposite to the town of Cambridge on the north side of the river Cam, having considerably increased as a residential place, and to the fact of all the College boat-houses being on that side of the river, the boat ferries have proved wholly insufficient for the traffic, besides being very inconvenient and unsafe for children. The town of Cambridge, therefore, joined with the Local Board of Chesterton and obtained Parliamentary powers for constructing a new road across Midsummer Common, just behind Jesus College, and a new bridge across the river. These works are now completed, and were formally opened on Thursday last by the Mayor of Cambridge, jointly with the chairman of the Chesterton Local Board. The new roadway is about half a mile long, and is 40 ft. wide; the bridge is 100 ft. clear span, 40 ft. wide between parapets, and has a clear headway at the centre of 14 ft. 6 in. above the normal water level, a towing-path 12 ft. wide, being formed on the south side. The superstructure consists of six elliptic wrought-iron arches, with braced spandrels, spaced 7 ft. 6 in. centre to centre under the roadway, and 9 ft. 1½ in. to the parapet girders. The outer spandrels are covered with cast-iron ornamental spandrels, surmounted with cornice, plinth, and parapet, the coats of arms of the Borough, University, County Council, and Local Board being on their respective panels in the centre of the spandrel. The roadway over the bridge is of granite macadam, and the footpaths of granolithic pavement. The abutments are of Portland cement concrete, resting on piled foundations, and faced with Darley Dale stone. The total cost of the work is about 14,000*l.* The engineers for the scheme are Mr. John J. Webster, M. Inst. C.E., of Liverpool and Westminster, and Mr. Frank Waters, of Cambridge; the whole of the work being designed by Mr. Webster, Mr. Waters acting as resident engineer. The sole contractor for the work was Mr. John Mackay, J.P., of Hereford, and he sublet the superstructure to the Butterley Company (Limited).

FOREIGN AND COLONIAL.

NORWAY.—The committee of architects appointed to consider the designs for a new Historical Museum at Christiania, has received seventeen designs. The first prize of 1,200 kr. has been awarded to Herr Karl August Henriksen, a comparatively unknown architect, whose design has been accepted in its main features. Third prize of 500 kr. has been awarded to Herr S. Lenschow, a leading Norwegian architect. Two new churches of considerable dimensions are being built by the State in Christiania.

RUSSIA.—According to news from St. Petersburg the Stadt Theatre at Irkutsk, in Siberia, and the Summer Theatre in Lublin, in Poland, have been burned to the ground, but no lives were lost. The authorities have decided to build immediately new theatres on the sites. In regard to the proposed French Art and Industrial Exhibition in Moscow next year, the German railway authorities have refused to carry the exhibits at reduced rates, so that the promoters will dispatch them by sea via Hull and Reval instead. The famous "Czar's Bell" in Moscow, one of the chief objects of interest in the old Palace of the Kremlin, is to be removed to a chapel built in memory of the saving of the Imperial family in the Borki railway accident. In the chapel tower, which is to be 270 ft. in height, and bell-shaped, the "Czar's bell" will be hung.

DENMARK.—The work on the so-called marble cathedral in Copenhagen is progressing. Of late the figures of the Apostles, 14 ft. in height and weighing 1,600 lb. each, and which are to adorn the main entrance, have been placed in position. They are of zinc, and executed by Danish artists. Two new public schools are to be erected in Copenhagen, at a cost of about 20,000*l.* Of late years several interesting frescos have been discovered in old Danish churches, dating from the thirteenth century, and much has been done for their preservation. They all appear to have been executed by foreign artists, probably monks. The subjects are biblical.

GENEVA.—The equestrian statue to Charles II. of Brunswick, which has been a doubtful ornament to the town for some twenty years, is at last going to disappear from view, the pediment alone remaining as a relic. This pediment is, however, to receive some crowning ornament, the design for which is to be obtained by "*international*" competition, the authorities having gone so far as to offer some very small prizes, at the same time giving would-be competitors about a month's time for sending in their work.—*Schweizer Bauzeitung.*

KARLSRUHE. — A monument to the deceased Emperor William I. is to be erected, and 120,000 marks have, so far, been voted for this purpose. The question as to the form of the proposed monument has been treated in a way not dissimilar to the "National Monument Question" at Berlin. Whilst public opinion and municipality were in favour of an architectural monument, the Grand Duke of the Duchy of Baden made known in a letter that he wished to see an equestrian statue erected in his capital. The municipality responded to the Grand Duke's wish by opening a competition for designs for a monument in this form, and the assessing jury unanimously recommended a design of Professor Volz's for erection, at the same time giving a second prize to Professor Heer. Professor Volz's design will, however, not be carried out, the Grand Duke having thought fit to recommend the design of the second prizeman to the municipality, who have again taken the wish for law.

FRANCE.—The Museum of Rouen has received a gift of a clock in Viedervilles faïence which is a very fine specimen of ancient Ceramic work.——M. Paul Maugin has left to the Museum of Douai an important collection of engravings and works of art.——A permanent picture exhibition has been opened in the Galerie Bertrand at Nice.——M. Rouvier, Minister of Finance, has presented to the small town of St. Jean de Villefranche sur Mer a statue, "Le Pêcheur" by the late Madame Rouvier, well known as a sculptor under the assumed name of Claude Vignon. She was one of the best pupils of Pradier.——The Academie des Beaux Arts has given "A Museum of Sculpture" as the subject of the competition for the Achille Leclère prize in architecture.——The competition opened for the construction of isolated pavilions for the lunatic asylum at Vaucluse has just been decided. M. Henri Poussin has received the first premium, M. E. Georges the second.——The jury in the competition for a Lycée for the town of Epinal has given its award. The first prize of 5,000 fr. has been awarded to MM. Clasquin and Monnenot; the second, 3,000 fr., to MM. Coquart and Delaire; the third, 2,000 fr., to M. Jasson; the first honourable mention to MM. Schuler and Berger, the second to M. Jacob. The jury, which has pronounced this to be a remarkably good competition, has decided that the execution should be entrusted to MM. Coquart and Delaire, as the authors of the most practical plan.——The Minister of Public Instruction has reappointed M. Foucart as the new director of the French school at Athens, a position which he has already held, the present appointment expiring with the close of the year. M. Foucart is also charged with an archæological mission to Egypt.—In getting out the foundations for the College St. Etienne at Châlons-sur-Marne, there have been found in an old well two sepulchral monuments adorned with sculpture and inscriptions, which appear to be as early as the fourth century. The monuments are rectangular and surmounted by pediments. Above each inscription is carved a figure of a horse and rider.——The Curé of the parish of St. Jacques de Guérets, near Vendôme, has discovered in his church two frescos of the twelfth century, interesting both in an artistic and archæological sense.——The new lunatic asylum for female patients at Bordeaux has just been opened. The architect is M. Valleton, of the Department of the Ministère de l'Interior.——A missionary at Tonkin, Père Garcia, has been occupied in constructing there an iron church, of which all the parts have been made in France and transported to the site. It is in the Gothic style, and 55 mètres long by 20 wide.——The Société Regional des Architects du Nord has addressed to the President of the Republic a petition against the dismissal of M. Coquart and a request that compensation should be made to him.——The death is announced, at Nouilompont, of M. Achille Flocon, member of the Société Centrale des Architectes, and director of architectural work for the Company of the Chemin-de-fer de l'Est.——We learn also of the death of M. Joseph Burn-Smeaton, wood engraver, born in London, but for a long time past resident in Paris. M. Burn-Smeaton was known by his annual exhibits at the Salon.——The French Fine Art Section of the Moscow Exhibition will include three galleries, of which two will be reserved for works of the highest class. There is also to be a retrospective exhibition of the works of masters of the French School.

MISCELLANEOUS.

PRIZES TO THE ROYAL ACADEMY STUDENTS.—Sir Frederic Leighton, P.R.A., on Wednesday presented the prizes gained by the students of the Royal Academy. Amongst the prize-winners were the following:—Design for the decoration of a portion of a public building (the "Adoration of the Magi").—Prize (40*l.*), Alfred Charles Weatherstone. Design in architecture (a country gentleman's house).—Travelling Studentship (60*l.*), Charles Sidney Spooner. Set of architectural drawings (a portion extending over one bay of the choir-stalls, and the screen at their back, in St. Paul's Cathedral).—Silver medal, first, Charles William Baker; second, not awarded. Set of architectural designs (Upper School).—Prize (25*l.*), Alexander Mackintosh. Set of drawings of an architectural design (Lower School).—Prize (10*l.*), James Cromar Watt. Plan of a building (a provincial picture and sculpture gallery). Prize (10*l.*), Herbert Tooley. Original composition in ornament.—Silver medal, not awarded. Perspective drawing in outline (open to architects only) (the end and three bays of the Hall in Hampton Court Palace).—Silver medal, no competition.

NORTH SEA-BALTIC CANAL.—The construction of the large twin-locks on the Baltic end of the canal is now to be taken in hand. These locks, which lie parallel to one another, have a total structural length of 216 meters. The accepted tender is for 3,860,000 marks, or nearly 193,000*l.* These locks, which will have sets of double gates at either end, can either be worked separately or together, according to the requirements. The measurements will permit two German ironclads of the largest type (say *König Wilhelm*, 108 meters stem to stern) to pass through with ease at the same time.

BERLIN.—The census held on the 1st inst. shows that Berlin proper has a population of 1,574,485. On the same date in 1885 the inhabitants of the capital numbered 1,315,287. This shows an increase of 259,198 in five years, or an average of about 52 000 per annum. The above numbers refer to Berlin proper. If the outer suburbs, such as Rixdorf, Schoneberg, &c., be included, the total would be about 1,800,000.

THE CHIEF INSPECTORSHIP OF CROWN MINES.—*The Western Mail* announces that the important offices of Chief Inspector of Crown Mines in Great Britain and Mineral Inspector for his Royal Highness the Prince of Wales for the Duchy of Cornwall, vacant by the decease of Sir Warrington W. Smythe, have been conferred upon Mr. Thomas Forster Brown, C.E., Deputy Gaveller and Crown Receiver for the Forest of Dean.

COMPETITION, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITION.

Nature of Work.	By whom Advertised	Premium.	Designs to be delivered.
*Drinking Fountain with Clock, &c. Longton	The Committee	5l. 3l. and 2l.	Jan. 31

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Shed and Covered Yard over Reservoir, &c. Keighley, Yorks	.....	W. & J. B. Bailey	Dec. 17
Limestone Gravel Metalling (500 tons)	Nantyglo and Blaina Local Board	*Official*	do.
*Purchase and Removal of Old Cottages	Lewisham Union	do.	do.
Alterations, &c. to Abbey Bridge, Tavistock	Devon County Council	do.	do.
Re-building portions of Horra Bridge, Walkhampton	do.	do.	do.
Widening Railway Line, Manchester	Lanc. & Yorks. Ry.	do.	do.
Enlarging Station, Llandudno	L. & N. W. R.	do.	do.
Pipe Sewer, &c.	Cheadle and Gatley Local Board	Edwd. Sykes	do.
Work at Grangetown School	Cardiff School Board	E. M. Bruce Vaughan	do.
*Bath Room at Brentford School	Brentford Union	E. Munson, Jun.	do.
*Supply of Lime and Cement (12 months)	Mile End Vestry	J. M. Knight	do.
*Works at Kentish Town, Sutton Bridge, &c.	M. R. Co.	*Official*	Dec. 18
Paving Works, Sutton-road	Plymouth Corporation	Geo. D. Bellamy	do.
Steel Wire Rope, &c. Glasgow	Messrs. Burns		Dec. 19
Enlargement of School, Handcross, Sussex	Slaugham Sch. Board	*Official*	do.
Eight Scullery Houses, Slack Side, Wibsey, Yorks	.....	John Drake	Dec. 20
*Pair of Houses, Blackheath	.....	Alfred Stead	do.
Shop and Offices, Old Market, Halifax	.....	W. H. D. Horsfall	Dec. 22
*Roadmaking Works	Lewisham Bd. of Wks	*Official*	do.
Taking-down Old and Erecting a New Dwelling-house, Saltash	T. E. Thriscutt	F. C. Jury	Dec. 23
Travelling Water Tanks	India Office	*Official*	do.
Making Promenade, Sewering, &c.	Wallasey (Birkenhead) Local Board	A. Salmon	do.
Ornamental Fence and Entrance Gates to Park, Liscard	do.	do.	do.
Reservoir (20,000 gallons), Water-wheel, Pump-house, Distribution Pipes, &c. Wingham, Kent	Eastry U.R.S.A.	*Official*	Dec. 27

CONTRACTS.—*Continued.*

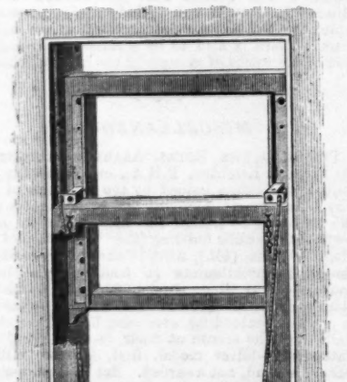
Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Waterworks	Sutton-in-Ashfield L.B.	G. Hodson	Dec. 29
Kerbing, Flagging, Landings, Setts, &c.	York Corporation	Alfred Creer	do.
Cutting Track, Pipe Laying, &c. Waterworks	Irvine (N.B.) Corp	J. & A. Leslie & Reid	do.
Removing an Old and Erecting a New Bridge over the Stour, near Bures, Essex	Essex and W. Suffolk County Council	Frank Whitmore	do.
Completion of Streets and Passages	Wavertree Local Board	Isaac Dixon	do.
*Iron Doors	Parish of St. Leonards, Shoreditch	F. J. Smith	Dec. 31
*External Iron Staircases, &c. at Infirmary	Hackney Union	*Official*	do.
*Enlargement of Rochdale Post Office	Com. of H.M. Wks, &c.	do.	Jan. 1
*Additions, &c. to Hospital Buildings, Leamington		do.	Jan. 2
*Roadmaking Works	Warneford Hosp. Com.	W. Menzies	do.
*Sewerage Works at Hertford Heath	Windsor R.S.A.	Bailey, Denton, & Co.	Jan. 12
*Erection of Urinal, Westminster Bridge	Ware U.R.S.A.	*Official*	Jan. 14
*New Entrance to Tyne Dock	London County Council	J. W. Barry	do.
Church, Earlston, Berwickshire	N. E. R. Co.	Hardy & Wight	No date
Warehouse, Milner Royd Mills, Halifax	.....	C. F. L. Horsfall	do.
Improvement to Premises, Guildford	.....	C. B. Oxley	do.
New Hall, Leeds	J. Lympass		
Nine Houses and Stabling, Armley, Leeds	Kingston Unity of Oddfellows	John M. Porter	do.
Six Houses, near Queen's-road, Leeds	.....	C. F. Wilkinson	do.
*Roadmaking Works, Aldershot	Jos. Popplewell	Thos. Howdill	do.
*Construction and Enlargement of Schools	War Department	*Official*	do.
New Hotel, Falmouth	School Bd. for London	do.	do.
Three Cottages, Castle Eden Colliery, co. Durham	The Cornish Hotels Co. Limited	.....	do.
Alterations and Additions to Woodland Pottery, Tunstall, Staffs	Wm. Laws	.....	do.
Drain Pipes (1,700 yards), Cwmtillery, Monmouthshire	.....	A. R. Wood	do.
Work at Higher Grade School	Lancaster, Speir, & Co.	.....	do.
	Gateshead Sch. Board	*Official*	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary	Applications to be in
*Teachers	Carpenters' Institute, Stratford	160l. and 140l.	Dec. 16
*Borough Surveyor	Worthing Twn. Coun.	250l.	Dec. 22

Those marked with an Asterisk (*) are advertised in this Number. Competition, p. iv. Contracts, pp. iv. and vi. Public Appointments, p. xviii.

OLROYD'S PATENT SASH-OPENER.—The accompanying cut illustrates the method of bolting or unbolting a window by means of this fastener, which consists of a barrel-bolt in a brass carriage on the lower sash, working into holes in the upper sash, so



Olroyd's Patent Sash Opener and Closer.

as either to keep the window closed or to keep it fixed open at any desired point. The bolts are kept fastened by springs, and pulled out by the cords as indicated. The bolt appears to be a very good, solid, and reliable one which it seems absolutely impossible to reach or meddle with from the outside.

SOCIETY OF ENGINEERS.—The annual dinner of this society was held on Wednesday evening at the Holborn Restaurant, the President, Mr. Henry Adams, occupying the chair. The company, which was numerous, included Sir Benjamin Baker and Sir J. N. Douglass (hon. members); Professor Unwin, Colonel Banister Fletcher, Mr. A. R. Binnie (Engineer to the London County Council); Mr. J. W. Wilson, jun. (vice-president); Mr. J. R. Baillie, Mr. Jabez Church, Mr. Chas. Gandon, Mr. Perry F. Nursey, Mr. Arthur Rigg, Professor Henry Robinson, and Mr. A. T. Walmisley (past presidents); Mr. Alfred Williams (hon. sec. and treasurer), and Mr. G. A. Pryce-Cuxson (secretary). After the usual loyal and patriotic toasts, the President proposed the toast of the evening, "The Society of Engineers." He said during the past year the number of members had increased by 8 per cent., exclusive of honorary members, and the attendance at the meetings had increased by 10 per cent. The honorary members who had recently been elected were Lord Armstrong, Dr. Anderson (of Woolwich), Sir B. Baker, Lord Brassey, Sir James Douglass, Sir John Fowler, Earl Granville, and Sir William Thomson. The papers which had been read and discussed included various branches of civil and mechanical engineering, and were fully up to the mark of previous sessions. The visits to works in progress and centres of manufacture, one of the privileges of members of the society which was very popular, had this year included the Thames Ironworks, the Royal Arsenal at Woolwich, and the London and North-Western Railway Works at Crewe. In concluding, the chairman said that the progress of the society was largely due to the energy of their founder and treasurer, Mr. Alfred Williams, and their secretary, Mr. Pryce-Cuxson.—The toast was acknowledged by Mr. Williams.—The "Health of the President" was proposed by Mr. Walmisley, and Mr. Adams responded, and gave the health of the president-elect, Mr. W. N. Colam, who was unable to be present. Other toasts followed.

STRIKE AT MESSRS. DOULTON'S LAMBETH POTTERIES.—A strike occurred last week at Messrs. Doulton's Lambeth potteries, the men complaining that the proportion of lads (apprentices) to journeymen is excessive, to the detriment of the journeymen. Sir Henry Doulton, in a letter to the *Times*, denies that there is any reasonable ground for these assertions. He further says:—

"As to the employment of apprentices generally, I have always strenuously upheld the advantage of apprenticeship, especially in such a handicraft as pottery, which requires considerable manual skill, only to be acquired by long training at an early age.

For many years I endeavoured to maintain that system, but, owing to the operation of the Masters and Servants Act and the altered conditions of work, it was a troublesome and unsatisfactory arrangement.

An alternative plan was adopted in all respects equivalent to legal apprenticeship, but substituting a mutual agreement of honourable understanding between the lad and his parents and the firm. By this plan the lad agrees, without any legal compulsion on either side, to work for the firm until he is twenty-one (usually beginning about the age of fifteen), and the firm agrees to employ him regularly as long as he conducts himself with propriety. In consideration of this the firm undertakes to teach the lad his trade without premium, paying him the accepted trade rates hitherto given to apprentices, and adding a yearly good-conduct bonus amounting to 5*l.* in all up to twenty years of age, and an additional bonus of 5*l.* at the close of the last year. They also agree to furnish the lad with a certificate of proficiency at the close of the term in the event of his leaving their employment.

The skilled artisans state that their own employment is endangered if the number of apprentices engaged is greater than one to every seven men. In my own establishments, however, this has never occurred. On the contrary, with an increasing number of skilled workmen there has always been an increase of trade."

MACHINERY AT THE SMITHFIELD CLUB SHOW.—In connexion with the Cattle Show at the Agricultural Hall, Islington, held on the first five days of this week, there was a very good show of implements and machinery by such well-known firms as Barrows & Co., Hill & Smith, F. Morton & Co., the St. Pancras Ironwork Co., Clayton & Shuttleworth, Aveling & Porter, Ransomes, Sims & Jefferies, E. S. Hindley, Aveling & Porter, E. R. and F. Turner, Waller & Steevens, R. Hornsby & Sons, Robey & Co., John Fowler & Co., and Marshall Sons & Co. Among the exhibits of the last-named firm must be mentioned an independent vertical engine cylinder, 6½ in. by 10 in., fitted with Mooro' patent crank-shaft governor and automatic cut-off balanced slide-valve, and a patent automatic sight-feed lubricator, &c. The engine is specially designed for use with electric-lighting plant. There is good provision for lubrication, and the governor, it is claimed, controls the engine to such a nicety that there is practically no variation in the speed, however much the load may change. Another exhibit worth special note is Priestman's oil-engine, which is shown in two sizes by Messrs. Priestman Bros., Limited, of Hull and London. An 11 h.-p. Priestman's patent portable oil-engine is mounted on wheels with shafts, &c., complete. The special feature of this exhibit is the application of this motive power in a portable form. The makers claim it to be the first introduction as such. In this form it is useful for many purposes, especially for country districts where there is no gas, or where gas is dear and it is not convenient to use steam. The cost of the oil-fuel, we are told, is about equal to the cost of working a gas-engine with gas at 3*s.* per thousand.

LEGAL.

INSANITARY HOUSES IN BETHNAL-GREEN.

At the Worship-street Police Court, on Wednesday, the magistrate, Mr. Montagu Williams, gave judgment in the matter of the 42 houses, the owners of which were proceeded against by the sanitary authority of the parish of St. Matthew, Bethnal-green, under the Housing of the Working Classes Act, to show cause why the said houses should not be closed. Proof of the insanitary condition of the houses was given last week by the officers—Messrs. Lapworth, Foot, and Weston—Mr. G. P. Bate, Medical Officer of the parish, certifying that they were unfit for human habitation. The magistrate had adjourned the matter in order that he might inspect the premises complained of and so form an opinion as to what length of time should be allowed the tenants for removing. According to the *Times* report, he now said that, having spent several hours in going in and about the houses complained of, he was convinced that, with regard to all but one, he ought to make the orders asked for. A house belonging to a Mr. Scott was so far advanced in satisfactory repair that there was no reason for making an order. With regard to the others, he could not see how they could be put into habitable state by any amount of repair. That, however, was a matter for the owners. How the people had lived in them he could not say. With respect to some houses in Cheshire-street, the people kept small shops, and he suggested that, as the businesses would be destroyed if the people were turned out at once, they should be allowed as long as possible,—two months,—to find other places, and, failing that, that they should be moved from house to

house,—that was to say, when one house was ready the occupants of the next to be repaired should be allowed to occupy it.

Dr. Bate said every attention should be given to that point.

Mr. Montagu Williams asked what had become of the County Council scheme with respect to clearing other sites in Bethnal-green, and providing houses for the people displaced?

Dr. Bate said that it was in abeyance.

Mr. Muskett Yetts, solicitor, on behalf of an owner named Dixon, raised objections to an order to close.

The magistrate said the houses could be reopened as soon as the Medical Officer was satisfied with their condition. The Act gave magistrates power to order the landlord to pay compensation for displacement to the tenants as a penalty for letting the houses get into such a condition. He had not put that power in force, and he thought the owners in these matters had been leniently dealt with. Having seen the houses, he was satisfied of their condition, and though he had been catechised as to why he decided to go, he could not see how one could know the condition of the places and the needs of the tenants unless personal inspection was made.

MEETINGS.

MONDAY, DECEMBER 15.

Royal Institute of British Architects.—8 p.m.

Society of Arts (Cantor Lectures).—Professor Vivian B. Lewes on "Gaseous Illuminants." IV. 8 p.m.

TUESDAY, DECEMBER 16.

Institution of Civil Engineers.—Further discussion on (1) Mr. F. E. Robertson's paper on "The Lansdowne Bridge over the Indus at Sukkur"; (2) Mr. E. W. Stoney's paper on "The new Chittravati Bridge, Madras Railway." 8 p.m.

Statistical Society.—7.45 p.m.

Manchester Architectural Association.—7.30 p.m.

Glasgow Architectural Association.—Mr. Francis H. Newberry on "Impressionism in Architecture." 8 p.m.

WEDNESDAY, DECEMBER 17.

Royal Meteorological Society.—Five papers to be read 7 p.m.

Society of Arts.—8 p.m.

THURSDAY, DECEMBER 18.

Society of Antiquaries.—8 30 p.m.

Leeds and Yorkshire Architectural Society.—"At the Cathedral Door," by Mr. Wyke Bayliss. 7.30 p.m.

York Architectural Association.—Mr. B. Priestley Shires on "The Domestic Life of the Middle Ages, as shown by its Architecture."

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

19,814.—SLOW-COMBUSTION GRATE: *G. T. Plunkett.*—The grate, which is the subject of this patent, has a specially-formed coving or hood, in order to assist the draught. A chamber is made at the back of the fire-place, and this and the coving is made in one piece to admit of current of warm air being generated and circulated in the apartment.

20,541.—FIREPLACES.—*W. Russel and Others.*—The improvement, which is the subject of this patent, is in the smoke exit and draught-regulator in "Withington" and such like grates, and consists in a sliding-box over the roof of the fire through which the products of combustion escape into the chimney, and from thence they may be readily removed. The front or canopy is hinged and in the interior of the box a sliding-flap is fitted in such a position that when it is thrown back the passage to the chimney is open and the flap acts as a check to blow down or back draught of smoke, &c., into the room. When the flap is drawn forward it falls against the front plate or canopy and closes the passage to the chimney when the grate is out of use.

11,978.—GLAZING: *H. Hilton.*—The glass rests on a cushion of lead or metal, and has a dust and water protector, and a covering cap fitted. The glazing-bar is of peculiar section, and is channeled to carry away condensation.

12,167.—ORNAMENTAL MOULDINGS: *O. Graetzer.*—Blocks or plates of end wood are made in a peculiar manner, and are strengthened so that they cannot spread under pressure. Trunks of trees are cut longitudinally, and planed at the sides with a serrated plane, which forms grooves. The sides are then painted with a thin layer of glue, put together, and exposed to hydraulic pressure, so that the beams adhere firmly together at every point. They are then cut across their longitudinal axis into end wood, then moulded by rollers under great pressure.

12,215.—PRESERVING PAINT BRUSHES: *H. Davis.*—This invention refers to a receptacle made of non-corrosive metal, with a contrivance for suspending the brushes clear from the bottom. A metal tube is inserted through the handles of the brushes, which are suspended by pins passing through the tubes.

15,533.—PORTABLE HOUSES: *F. Wheeler.*—The pieces composing the house, shed, kennel, or similar structure are shaped and numbered in such a manner that they may be promptly and easily taken to pieces, or erected for cleaning or transport.

15,541.—FIREPROOF DOORS, &c.: *R. Hallenstein.*—Doors are fitted to lift openings, and are automatically closed by the action of the lift, or worked by hand-power. Suitable mechanism for this purpose is described.

NEW APPLICATIONS FOR LETTERS PATENT.

November 24.—19,014, D. Gill, Water-closet Apparatus.—19,056, G. Kincaid and H. Goujon, Lining Brush Attachment.—19,063, T. Recknell, Ceilings.

November 25.—19,078, W. Day, Chimney-cowl.—19,139, W. P. Thompson, Cowls for Chimneys, &c.—19,141, W. Thompson, Door-hinges.—19,144, G. Williamson and A. Culpin, Metallic-hinges for Doors, &c.—19,154, J. Bardsley, Door-spring and Check.—19,189, C. Keith, Grates.—19,192, G. Spring, Sash-holders.

November 26.—19,213, R. Batey, Norfolk and Suffolk Latches.—19,249, J. Wintesflood, Ventilating Geysers.—19,260, C. & J. Smith, Wood-working Machines.

November 27.—19,292, H. Hardy, Connecting Lead-pipe to Earthenware.—19,302, J. Brookfield and A. Whitehead, Cramp for Picture-frames, &c.—19,306, T. Switzer, Mitreing Mouldings, &c.—19,320, R. Henderson, Fire-grates, &c.—19,329, E. Edwards, Imitation Walnut-wood.—19,348, A. Whitehead and J. Brookfield, Window-sash Fasteners.

November 28.—19,415, J. Spear, Ornamentation of Wood.

November 29.—19 446, H. Dwight and others, Hanging of Doors.—19,464, H. Chaplin, Draught, Dust, or Water Excluder for Doors, Windows, &c.—19,476, J. Bayly, Rock Drill.

PROVISIONAL SPECIFICATIONS ACCEPTED.

15,320, J. Smeaton, Ventilation and Flushing of Drains, Sewers, Soil-pipes, &c.—16,789, R. Stone, Fire-proof Plastic Material for Cement, &c.—17,205, T. Plevins, Flushing Closets.—17,238, H. Peake, Weather Strips for Doors and Casement Windows.—17,417, G. Lewin, Door Handles, &c.—17,581, T. Twyford, Sinks.—17,595, J. Dixon, Securing Windows, &c.—17,634, W. Bell and others, Self-locking Casement Stay.—17,668, E. Cusack, Automatic Sash Bolt.—17,748, J. & A. Duckett and L. Stanworth, Flushing Tanks and Water-closets.—17,805, J. Bell, Door Latches.—17,849, C. Hearson, Flushing Apparatus.—17,867, E. Edwards, Sawing Machinery.—17,971, E. George, Combination Wood-working Machines, for Planing, Moulding, Tenoning, &c.—17,983, A. Whowell & E. Chadwick, Water-closets.—18,009, J. Bayly, Bench Planes.—18,095, J. Le Missurier, Window Fastenings, &c.—18,131, E. Hatton, Ventilating Valves and Wall Ventilators.—18,382, J. Woodward, Wearing Surfaces of Stair-treads, &c.—18,397, R. Hewetson, Fastener for Doors or Windows.—18,468, F. Jurschina and R. Von Gunesch, Artificial Stone, or Composition and Building Blocks, &c., thereof.—18,474, W. Chapman, Window Fastening.—18,520, A. Crosnier, Doors and Windows.—18,603, T. Arnold, Manufacture of Cement.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

1,139, G. Hurdle, Self-lubricating Pulleys for Window Sashes, &c.—1,346, W. Sugg, Ventilating Apparatus.—1,527, T. Jones, Gasfitters' Blow-pipe.—12,591, J. Ricketts and T. Lorrance, Couplings for Water-closets.—13,315, G. Redfern, Roofing Tiles.—16,067, F. Synde, Gully Watercloset and other Traps.—16,966, D. Gardner, Jointing Pipes or Tubes.—17,047, J. Barclay, Water-closet Basins.—17,185, J. Flousch, Screw Nails, &c

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

DECEMBER 2.—By *Weston & Son:* 1, Geneva-rd., Brixton, u.t. 76 yrs., g.r. 8*l.*, r. 36*l.*, 300*l.*; 50 to 62 (even), Lansdowne-rd., Clapham-rd., u.t. 69 yrs., g.r. 42*l.*, r. 290*l.*, 2,240*l.*—By *Sherrin & Coltman:* f.g.r. of 100*l.*, u.t. 54 yrs., at a peppercorn, Hampstead, 1,900*l.*; 6 and 24, St. John's-rd., Holloway, f., r. 60*l.* p.a., 775*l.*—By *Chesterton & Sons:* 35 and 37, Warwick-gardens, Kensington, u.t. 58 yrs., g.r. 8*l.*, 2,300*l.*; 39, Warwick-gardens, u.t. 58 yrs., g.r., 4*l.*, r. 100*l.*, 1,780*l.*—By *Randall, Beard, & Baker:* 5, Lambourn-rd, Clapham, u.t. 54 yrs., g.r. 5*l.* 5s., r. 34*l.*, 349*l.*; 58, Manor-rd., u.t. 17 yrs., g.r. 5*l.* 3s., r. 30*l.*, 150*l.*—By *Debenham, Tewson, & Co.:* 22, Brondesbury-villas, Kilburn, u.t. 67 yrs., g.r. 10*l.*, r. 60*l.*, 560*l.*; 24, Brondesbury-villas, u.t. 67 yrs., g.r. 10*l.*, r. 65*l.*, 620*l.*; 30 and 32, Brondesbury-villas, u.t. 67 yrs., g.r. 24*l.*, r. 140*l.*, 1,280*l.*; 78 and 80, Denmark-rd., u.t. 69 yrs., g.r. 12*l.* 5s., r. 93*l.*, 525*l.*; 2, 3, and 4, Rupert-rd., u.t. 69 yrs., g.r. 17*l.* 10s., r. 120*l.* 12s., 605*l.*; 37, Cambridge-rd., Lee, u.t. 74 yrs., g.r. 10*l.*, 300*l.*; 164, Southgate-rd., Kingsland, u.t. 33 yrs., no g.r., 370*l.*

DECEMBER 3.—By *W. Coppin:* 110, Chetwynd-rd., Dartmouth Pk., f., r. 50*l.*, 600*l.*; 108, 115, and 113, Chetwynd-rd., f., r. 135*l.*, 1,790*l.*; 79, Chetwynd-rd., f., r. 30*l.*, 370*l.*; a f. cottage adjoining, r. 30*l.*, 375*l.*—By *Rogers, Chapman, & Thomas:* 26, Denbigh-pl., Pimlico, u.t. 40 yrs., g.r. 8*l.*, r., 60*l.*, 625*l.*—By *E. Evans:* 152, 154, and 156, Leathwaite-rd., Clapham, u.t. 94 yrs., g.r. 19*l.* 10s., r. 90*l.*, 740*l.*; f.g.r. of 5*l.*, with reversion in 74 yrs., 110*l.*

DECEMBER 4.—By *A. Watson:* 100, 102, and 104, Gayford-rd., Shepherd's-bush, u.t. 91 yrs., g.r. 19*l.* 10s., r. 87*l.* 4s., 320*l.*—By *Briant & Son:* A f. plot of land, Eastcote-st., Stockwell, ; 1,720*l.*; No. 134, Camberwell New-rd., u.t. 11 yrs., no g.r., r. 40*l.*, 150*l.*—By *A. G. Thomson & Co.:* 29 & 31, Ursula-st., Battersea, u.t. 87 yrs., g.r. 12*l.*, r. 53*l.* 18s., 470*l.*—By *J. H. Hunter:* 73, Hornsey-rd., Holloway, u.t. 52 yrs., g.r. 6*l.* 6s., r. 55*l.* p.a., 410*l.*; 59, Windsor-rd., u.t. 62 yrs., g.r. 5*l.* 5s., r. 30*l.*, 320*l.*—By *Newbon & Harding:* 2, Aubert-pk., Highbury, u.t. 91 yrs., g.r. 8*l.*, r. 38*l.*, 345*l.*; 133, Copenhagen-st., Barnsbury, u.t. 53 yrs., g.r. 5*l.*, 400*l.*; 2, Barnsbury-rd., u.t. 57 yrs., g.r. 10*l.*, 380*l.*; 14, Healey-st., Kentish Town, u.t. 68 yrs., g.r. 7*l.*, r. 37*l.*, 330*l.*; 41, Gifford-st., Caledonian-rd., u.t. 54 yrs., g.r. 6*l.*, r. 30*l.*, 220*l.*; 5 and 6, Highfield-ter., Wood Green, u.t. 91 yrs., g.r. 5*l.*, 100*l.*—By *Walker & Runtz:* 4 and 5, Haverstock-st., City-rd., u.t. 74 yrs., g.r. 12*l.*, r. 64*l.*, 485*l.*; 10, Jackson-rd., Holloway, u.t. 72 yrs., g.r. 6*l.* 6s., r. 38*l.*, 350*l.*; F.g.r. of 21*l.*, with reversion in 77 yrs., East Dulwich, 480*l.*; F.g.r. of 27*l.*, with reversion in 96 yrs., Walthamstow, 540*l.*

DECEMBER 5.—By *Rushworth & Stevens:* No. 27, New Bond-st., City leasehold, g.r. 6*l.*, r. 410*l.*, 9,720*l.*—By *Bennett & Goodman:* 67, Tufnell Pk.-rd., Holloway, u.t. 74 yrs., g.r. 9*l.*, 495*l.*; 4, 6, and 8, Upper Winchester-rd., Catford, u.t. 75 yrs., g.r. 12*l.*, r. 62*l.*, 400*l.*; f.g.r. of 5*l.*, with reversion in 77 yrs., Peckham, 107*l.*—By *A. & A. Field:* f.g.r. of 83*l.* 6s., u.t. 11 yrs., at a g.r. of 14*l.*, King's Cross, 420*l.*; 106 to 114 (even), High-st., Bromley-by-Bow, u.t. 92 yrs., g.r. 30*l.*, 700*l.*; 5, Leyton-villas, Leyton, u.t. 78 yrs., g.r. 5*l.*, r. 24*l.*, 172*l.*; 26 and 28, Clever-st., Victoria Docks, u.t. 91 yrs., g.r. 7*l.* 10s., 170*l.*

[*Contractions used in these lists.*—F.g.r. for freehold ground-rent; f.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	6 15 0	7 5 0
Teak, E.I. ....load	10 0 0	13 0 0
Sequoia, U.S. ....foot cube	0 2 3	0 3 0
Ash, Canada ....load	2 10 0	4 5 0
Birch " ....load	2 5 0	4 5 0
Elm " ....load	3 10 0	4 15 0
Fir, Dantzic, &c. ....load	2 0 0	3 15 0
Oak " ....load	2 10 0	4 10 0
Canada ....load	4 17 6	6 10 0
Pine, Canada red ....load	2 10 0	3 10 0
" yellow ....load	2 0 0	5 10 0
Lath, Dantzic ....fathom	5 0 0	6 0 0
St. Petersburg ....load	5 0 0	7 0 0
Deals, Finland, 2nd & 1st. std. 100	7 10 0	10 0 0
" " 4th and 3rd	7 0 0	7 5 0
Riga ....load	6 0 0	8 0 0
St. Petersburg, 1st yellow	9 10 0	14 10 0
" 2nd "	7 10 0	9 0 0
" white	7 0 0	10 0 0
Swedish ....load	7 0 0	15 10 0
White Sea ....load	8 0 0	17 0 0
Canada, Pine, 1st ....load	13 0 0	24 0 0
" " 2nd ....load	9 0 0	16 0 0
" " 3rd, &c. ....load	7 0 0	10 0 0
" Spruce, 1st ....load	8 10 0	10 10 0
" " 3rd and 2nd ..	6 10 0	8 0 0
New Brunswick, &c. ....load	5 10 0	7 10 0
Battens, all kinds ....load	4 10 0	15 10 0
Flooring Boards, sq., 1 in., prepared, First	0 10 0	0 14 0
Second	0 8 0	0 10 6
Other qualities	0 5 6	0 7 9
Cedar, Cuba ....foot	0 0 4	0 0 5
Honduras, &c.	0 0 3½	0 0 4½
Mahogany, Cuba	0 0 4½	0 0 6½
St. Domingo, cargo average ..	0 0 4½	0 0 6½
Mexican "	0 0 4½	0 0 5½
Tobasco "	0 0 5½	0 0 6½
Honduras "	0 0 5½	0 0 8½
Box, Turkey ....ton	4 0 0	13 0 0
Rose, Rio	12 0 0	19 0 0
Bahia	10 0 0	18 0 0
Satin, St. Domingo ....foot	0 0 9	0 1 3
Porto Rico	0 0 10	0 1 6
Walnut, Italian	0 0 4	0 0 7
METALS.		
IRON—Bar, Welsh, in London tn	6 10 0	6 17 6
" " at works in Wales	6 0 0	6 10 0
" Staffordshire, in London..	7 0 0	8 0 0
COPPER—British, cake and ingot	60 10 0	61 0 0
Best selected	62 10 0	63 10 0
Sheets, strong	68 0 0	0 0 0
Chili, bars	55 5 0	0 0 0
YELLOW METAL ....lb.	0 0 6¾	0 0 6¾
LEAD—Pig, Spanish ....ton	12 10 0	0 0 0
English, com. brands	0 0 0	0 0 0
Sheet, English, 3 lbs. per square foot and upwards....	15 0 0	15 10 0
Pipe	16 10 0	0 0 0
ZINC—English sheet ....ton	28 10 0	29 0 0
TIN—Straits	92 10 0	0 0 0
Australian	92 10 0	0 0 0
English Ingots	0 0 0	0 0 0
OILS.		
Linseed ....ton	21 7 6	21 15 0
Cocoanut, Cochin	34 0 0	34 10 0
" Ceylon	31 0 0	31 10 0
Palm, Lagos	26 10 0	0 0 0
Rapeseed, English pale	28 5 0	0 0 0
" brown	26 15 0	0 0 0
Cottonseed, refined	18 0 0	0 0 0
Tallow and Oleine	21 0 0	40 0 0
Lubricating, U.S.	5 0 0	6 0 0
" refined	7 10 0	12 0 0
TAR—Stockholm ....barrel	1 1 0	0 0 0
Archangel	0 14 6	0 0 0

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *noon on Thursdays.*]

CROYDON.—For the erection of nine villas, Normanton-road-South Croydon. Mr. E. C. Homer, architect, 99, Gresham-street, E.C.:—

F. Johnson (accepted) £10,125

CROYDON.—For erection of coach-house and stables, additions, and decorative repairs at Shirley Lodge, Croydon, for Mr. John Pelton. Mr. Charles Henman, architect:—

S. Page	£1,434 0	Goulder & Glasscock	£1,215 0
Ridge & Broughton	1,241 10	M. Taylor (accepted)	1,179 0

[All of Croydon.]

DERBY.—For hot-water supply to baths and heating by steam, vagrant wards, &c., for the Union Guardians. Messrs. Coulthurst & Booty, architects, 4, Albert-street, Derby. Quantities by the architects:—

Bradley Bros.	£451	Crump & Co.	£340
Bradford & Co.	385	H. Baker	340
Dawson & Co.	358	J. Jarram, Derby (accepted)	288

DUBLIN.—For the erection of a new fish and vegetable market, Dublin, for the Corporation. Mr. Spencer Harty, City Surveyor, City-hall, Dublin:—

	Contract No. 1. Building, &c.	Contract No. 2. Iron roof, &c.
J. Good	£18,681 10 3	£4,974 0 0
J. P. Pile	18,500 0 0	6,390 0 0
J. & B. Beckett	17,000 0 0	6,500 0 0
Collen Bros.	16,222 14 0	6,453 18 0
S. Worthington	15,588 0 0	4,691 0 0
Hudman & Co.	15,500 0 0	4,850 0 0
H. & J. Martin	14,894 12 9	4,998 10 0
W. Connolly & Son, Dublin*	14,700 0 0	5,741 0 0
W. Spence	—	6,327 14 10
Handyside & Co.	—	5,429 9 9
Arrol Bros.	—	4,746 8 3
J. Lysaght, Bristol*	—	4,359 0 0

* Accepted.

DUBLIN.—For the erection of a new pumping station at Forbes-street, Dublin, for the Corporation. Mr. Spencer Harty, City Surveyor, City Hall, Dublin:—

Contract No. 1.—Buildings, &c.

Hudman & Co.	£3,350 0 0
Collen Bros.	1,950 18 6
S. Worthington	1,896 0 0
John Cunningham	1,895 0 0
Wm. Connolly & Son	1,700 0 0
H. & J. Martin, Ltd., Dublin*	1,372 12 3

Contract No. 2.—Boilers, Pumps, &c.

Drysdale & Co.	2,600 0 0
Wm. Spence, Dublin*	2,048 10 0

* Accepted.

GATESHEAD.—For the erection of additional stabling, &c., at Albany-road, for the Gateshead Corporation. Mr. J. Bower, Borough Surveyor, Town Hall, Gateshead :—

Geo. Smith	£910	0	0
Greason Bros.	875	15	0
R. McKew	875	8	4
Sharp Bros.	875	0	0
J. T. Simpson	£875	0	0
T. H. Hutchinson, Gateshead*	866	0	0

* Accepted.

GREAT YARMOUTH.—For constructing a retaining wall for widening the Marine Parade, for the Great Yarmouth Town Council. Mr. J. W. Cockrill, Borough Surveyor, Town Hall, Great Yarmouth. Quantities by Borough Surveyor :—

Bond	£1,095	0	0
W. Cork	1,052	3	0
W. Barnard	999	0	0
R. Nudd	992	10	0
J. F. W. Bray	940	0	0
W. Beech	£924	0	0
W. Stacey, Martham, Great Yarmouth*	778	7	6
S. Hipwell	710	0	0

* Committee recommends Council to accept this tender.

[Borough Surveyor's estimate, £988.]

GREAT YARMOUTH.—For pulling down and rebuilding the "Gallon Pot" public-house and premises adjoining, King-street, Great Yarmouth, Norfolk, for Mr. Walter Diver. Mr. H. I. Newton, architect, 49, Victoria-street, Westminster, S.W. Quantities by Mr. F. Thomson, of 5, Great James-street, Bedford-row, W.C. :—

T. Howes, Great Yarmouth (accepted) £1,883 9 0

HOUGHTON-LE-SPRING.—For the formation of a new cemetery at Hetton-le-Hole, together with buildings, &c., for the Houghton-le-Spring Union Rural Sanitary Authority. Mr. D. Balfour, engineer, 3, St. Nicholas-buildings Newcastle-on-Tyne :—

P. Bradley	£4,647		
J. T. Simpson	4,360		
J. Carrick	3,772		
T. Dixon	£3,745		
R. Hudson, jun., Sunderland (accepted)	3,690		

LIVERPOOL.—For converting baths and washhouse into a lying-in ward, at the Workhouse, Smithdown-road, for the Guardians of Toxteth Park. Mr. Walter W. Thomas, architect, 25, Lord-street, Liverpool :—

Henry Whitehead	£858	0	0
Briggs & Hopkinson	750	0	0
W. Tomkinson & Sons	679	0	0
W. Thornton & Sons	666	5	0
Nicholson & Clarke	636	0	0
Raffle & Campbell	633	10	0
Jas. Holme	629	0	0
Saml. Webster	£597	0	0
Jas. Crosbie	595	10	0
Jacob Comins	574	10	0
Jno. O'Rill	565	0	0
Isaac Dilworth, Wavertree (accepted)	550	0	0
Geo. Harris	525	2	6

LONDON.—For rebuilding the front, and other work, at the "Northumberland Arms" public-house, Northumberland Avenue, Charing-cross, S.W. Mr J. W. Brooker, architect, 13, Railway Approach, London Bridge, S.E. :—

A. Garratt	£753		
G. J. Kick	745		
R. G. Battley (accepted)	£725		

LONDON.—For the erection of a tenement house and stabling in Webb-street, Bermondsey New-road, S.E. Mr. J. W. Brooker, architect, 13, Railway-approach, London Bridge, S.E. :—

Wm. Downs	£1,415		
Burman & Son	1,350		
Jocelyne	1,338		
Battley	1,294		
G. J. Kick	£1,240		
H. ward	1,192		
Garratt*	1,097		

* Accepted.

LONDON.—For rebuilding the "British Oak" public-house, Lea Bridge, for Mr. Jeffries. Messrs. Edmeston & Gabriel, architects, 42, Old Broad-street, E.C. :—

F. & H. F. Higgs	£1,320		
Carmichael	1,190		
Holland	1,168		
Young & Lonsdale	1,148		
Everard	£1,089		
Godfrey & Son	1,077		
Furniss	998		

LONDON.—For alterations and decoration at the "City of Salisbury" public-house, Tooley-street, S.E. Mr. J. W. Brooker, architect, 13, Railway-approach, London Bridge, S.E. :—

Alterations.			
Kick	£750		
Battley	631		
Garratt*	552		
Decorations.			
Garratt	£178		
Battley	178		
Kick	161		
Gilbert (accepted)	160		

* Accepted.

LONDON.—Accepted for works at "Lorano," Clapham-park, for Mr. B. Nathan :—

Wm. Lang, Balham £213 15 6

LONDON.—For the erection of laundry and stables in the rear of 39 and 41, Peckham-grove, S.E., for Mr. W. Reynolds. Mr. James Warne, architect, 137, Fenchurch-street, E.C. :—

Tyerman	£363		
Parker	359		
A. W. Neal	355		
G. Neale	£349		
Jocelyn & Young	339		

LONDON.—For alterations of fittings and decorations to the bar at the "Victoria" public house, Burdett-road, E. Mr. J. W. Brooker, architect, 13, Railway Approach, London Bridge, S.E. :—

Curtis & Sons	£334		
J. Warne	291		
A. Garratt	£268		
G. J. Kick (accepted)	250		

LONDON.—For the erection of houses in Seven Sisters-road, Stamford-hill, N. Mr. E. C. Homer, architect, 99, Gresham-street, E.C. :—

Horlock (accepted) £2,400

LONDON.—For repairs and alterations to premises, St. Anne's-row, Limehouse. Mr. F. J. Smith, architect, Winchester House, E.C. :—

R. Battley	£940		
Rice & Son	895		
C. Forrest	737		
W. McSwiney	£721		
J. Ivory	485		

PAIGNTON.—For the erection of suites of offices, for Mr. J. T Paish. Mr. W. G. Coulasey, architect :—

C. & R. E. Drew	£775	0	
H. Webber	768	2	
Westlake	710	0	
Rabbich & Brown*	£698	0	
Deller	697	0	
R. Harris	669	10	

* Accepted.

PONTYPRIDD.—For rebuilding shop premises at Ynyshir, near Porth, Pontypridd, for the Co-operative Society (Limited). Mr. E. Jones, architect, Cymmer, Porth, Pontypridd :—

William Ellis Jones, Ynyshir (accepted) £307 10 0

[Architect's estimate, £304 6s. 3d.]

WARRINGTON.—For steam-heating and hot-water supply to wards at workhouse, for the Union Guardians :—

Bradford & Co.	£299	0	0
Wm. Jones & Sons	159	12	6
Elliott, Olney & Co., Limited	158	10	0
E. Forshaw & Son	148	0	0
Crumblehulme & Sons	£145	0	0
Killick & Cochran, Seel-street, Liverpool*	140	0	0

* Accepted.

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